

REPORT ON SOME AMPHIPODA, ISOPODA, AND TANAIIDACEA IN THE COLLECTIONS OF THE INDIAN MUSEUM.

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The collection on which this report is based, though not extensive, has proved very interesting. In addition to records of new localities for species already known from India, seven new species are proposed in the Amphipoda, and one each in the Isopoda and the Tanaidacea.

Some differences of opinion are to be found, as is only to be expected between different authors. The separation of *Talorchestia* and *Orchestia*, for example, is a tricky point; and the problem arising from the specimens of *Hyale brevipes* in the present collection is only stated, but by no means answered.

The presence in Tibet of a subspecies of *Gammarus pulex* recently described from northern Siberia is noteworthy.

An attempt has been made to sort out the species of *Grandidierella*, and with the concurrence of the Director, Zoological Survey of India, the description of a new species of this genus from South Africa is included.

Among the Isopoda is a second species of the curious Anthurid genus *Xenanthura*.

To Dr. B. Prashad, Director of the Zoological Survey of India and to Dr. B. Chopra I express my thanks for the privilege of studying this collection, which has mostly been brought together by various members of the staff of the Survey.

AMPHIPODA.

Family AMPELISCIDAE.

***Ampelisca pusilla* Sars.**

1920. Chilton, *Rec. Ind. Mus.* XIX, p. 79.

1921. *id.*, *Mem. Ind. Mus.* V, p. 523.

Locality.—Neendakara Bay, Travancore. H. S. Rao and M. Sharif. February 1928. 39 ♂♂, ovig. ♀♀, and juv.

Remarks.—Chilton has discussed the probable identity of the Indian and Norwegian forms. Pending a thorough revision of the genus no further comment is possible.

Family OEDICEROTIDAE.

***Oediceros* sp.**

Locality.—Karitalachal, Cochin, S. India. H. S. Rao. January 1928. 3 ovig. ♀♀.

Remarks.—These small specimens, measuring 2 mm. in length, appear to belong to this genus, but the material is too scanty to attempt a specific determination.

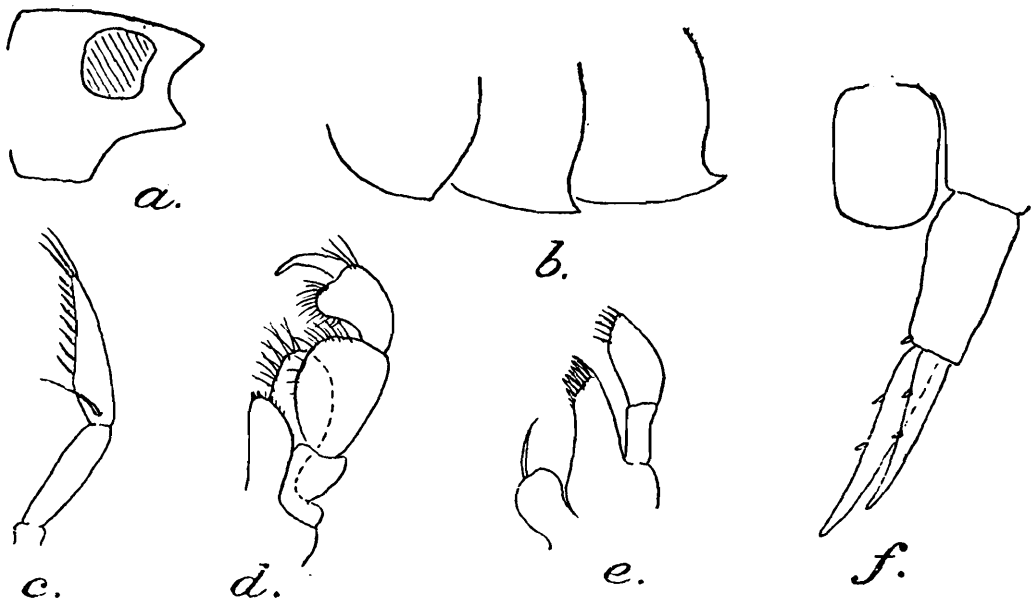
Family CALLIOPIDAE.

Paracalliope indica, sp. nov.

- ? 1890. Giles, *J. Asiat. Soc. Bengal* LIX, p. 70, pl. ii, fig. 6. (*Parapleustes pictus*.)
 ? 1906. Stebbing, *Das Tierreich* XXI, p. 297. (*Calliopius pictus*.)
 1921. Chilton, *Mem. Ind. Mus.* V, p. 529, fig. 3. (*Paracalliope fluviatilis* non Thomson.)

Locality.—Salt Lakes, Calcutta, Lower Bengal. 23-24th February 1928. Dr. B. N. Chopra. 2 specimens (apparently ♂♂). 4.5 mm.

Description.—Antero-lateral angles of head moderately acute; rostrum not prominent. Eyes very large, rounded-quadrangular, separated dorsally by a distance equal to half a diameter. Hind margins of peraeon and pleon segments dorsally entire. Side-plates 1-4 with few and slight setiferous indents on lower margins; hind margin of 4 feebly excavate.



TEXT-FIG. 1.—*Paracalliope indica*, sp. nov. a. head; b. pleon segments 1-3; c. mandibular palp; d. maxilliped; e. maxilla 1; f. telson and uropod 3.

Postero-inferior angle of pleon segment 1 subrounded, with indication of a slight point; of segments 2 and 3 shortly produced in acute points, the margin above the point on segment 3 indented and sinuous. Telson, width slightly more than half the length, posterior margin evenly rounded.

Antenna 1, 1st joint stout, 2nd much more slender, $\frac{2}{3}$ length of 1st, 3rd scarcely $\frac{1}{2}$ length of 2nd. Antenna 2 subequal in length to 1st antenna, 4th and 5th joints subequal. Flagella of both antennae 16-17-jointed, with calceoli on the basal 6-7 joints.

Upper lip entire. Lower lip with inner lobes.

Mandible, spine-row very feeble, molar well developed, palp with 3rd joint equal to 1st plus 2nd, the latter without setae, 3rd joint with one long basal seta, about 8 spine-setae on margin, and 3 apical setae.

Maxilla 1, inner lobe with a single long seta, palp with 1st joint rather slender, parallel-sided, 2nd ovate. Maxilla 2, inner lobe with setae on apex only.

Maxilliped, outer margin of base of outer lobe very short, 2nd joint of palp broadly ovate, 3rd lobed on inner apex, 4th unguiform.

Gnathopods 1 and 2, compare Chilton's figs. 3 *d* and *e* of *P. fluviatilis* (*l. c.*, 1921). Peraeopods 1-4, also compare Chilton's figure 3*a*. Peraeopod 5 missing from both specimens.

Uropods 1 and 2, peduncle and rami completely spineless; outer ramus in uropod 1 slightly shorter, in uropod 2 distinctly shorter than inner ramus. Uropod 3, peduncle with 1 apical spinule, outer ramus shorter than inner, both with 2 spinules on upper margin.

Remarks.—Thanks to Mr. A. G. H. Helson, of Canterbury College, Christchurch, N. Z., I have been able to examine some typical examples of the New Zealand *Paracalliope fluviatilis*. I have also seen some of the Chilka Lake specimens identified by Chilton as this species.

The present two specimens are identical with the Chilka Lake specimens, and in my opinion they cannot be regarded as conspecific with the true New Zealand *fluviatilis*, as they differ in the following characters: larger eyes, mandibular palp more slender, especially the 3rd joint, the inner lobe of maxilla 1, the lack of setae on inner lobe of maxilla 2, the much broader 2nd joint of palp of maxilliped, the complete absence of spinules on uropods 1 and 2, and their reduction to 2 on the rami of uropod 3, and the postero-inferior angles of pleon segments 1-3—a series of characters which seems to justify specific separation.

The last mentioned character is that most easily observed, and which attracted attention as it did not coincide with Chilton's fig. 3*a*. In *P. fluviatilis* the postero-inferior angle of segment 3 is quadrate (Stebbing, 1906, *l. c.*, p. 297 says: subquadrate). Thomson's original figure is useless. Chilton does not refer to this character, which in his 1921 figure of the whole animal is incorrectly drawn: even as drawn it does not agree with the New Zealand specimens, and still less with the Indian specimens.

The Philippine Island specimens of *P. fluviatilis* might well be re-examined (Chilton, 1920, *Philipp. J. Sci.* XVII, p. 513).

Family GAMMARIDAE.

Gammarus pulex (Linn.).

1894. Sars, G. O., *Crust. Norway I*, p. 503, pl. clxxvii, fig. 2.
 1908. Chevreux, *Trav. Soc. Imp. Nat. St. Petersb.* XXXVII, pp. 91-110.
 1914. Tattersall, *Rec. Ind. Mus.* X, p. 213.
 1914. [Annandale], *ibid.*, p. 215.
 1922. Tattersall, *Mem. Asiat. Soc. Bengal VI*, p. 451, pl. xx, figs. 19-27.
 1934. Ueno, *Mem. Connectic. Ac. Sc.* X, p. 63, pls. iii-vii.

Subsp. *extensus* Mart.

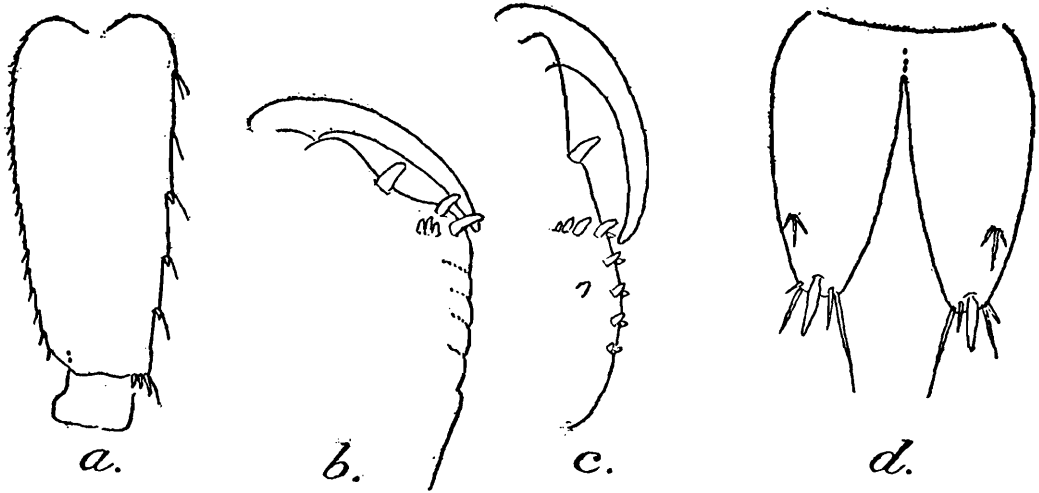
1932. Martynov, *Ann. Mus. Zool. Ac. Leningrad* XXXII, p. 533 (Engl. p. 538), fig. 1 *a, b, c*.

Locality.—Dochen, Tibet, 14,700 ft. Lt.-Col. F. M. Bailey. 21st June 1928. 1 immature ♀. 13 mm.

Description.—Resembling in general *pulex*. Eyes and lateral lobes of head as in *pulex*. Postero-interior angle of pleon segment 3 acutely pointed (*cf* Chevreux & Fage, *Amph. France*, fig. 264, 1925, and Ueno,

pl. 4, 1934). Pleon segments 4-6 each with 2 medio-dorsal spinules and one dorso-lateral, with 1-2 minute setae in each group. Telson with one apical spine on each lobe, flanked by 2 unequal spine-setae on each side, a group of 3 spinules at $\frac{2}{3}$ length, no spine in basal third.

Antenna 1, flagellum 21-jointed, not strongly setose, accessory flagellum 3-jointed, the 3rd joint minute, its length equal to width of 2nd joint. Antenna 2, flagellum 10-jointed, not strongly setose. Maxilla 1 with 1 spinule on outer margin of 2nd joint of palp.



TEXT-FIG. 2.—*Gammarus pulex* (Linn.) subsp. *extensus* Mart. a. 2nd joint of peraeopod 5; b. palm of gnathopod 2 (long setae in notches on lower margin omitted); c. palm of gnathopod 1; d. telson. (In b and c the series of three submarginal spines and the single one in c are on the inner surface.)

Gnathopods 1 and 2 as in *pulex*; details of palms see fig. 2 b, c.

Peraeopods 3-5, 2nd joints more elongate than in *pulex*; in peraeopod 3 2nd joint half as long again as broad, in peraeopod 4 twice as long as broad, in both peraeopods about the same width throughout its length, lower hind corners rounded-quadrangular; in peraeopod 5 2nd joint twice as long as basal width, slightly and evenly tapering, lower hind corner bevelled off.

Uropod 3, no spinule on outer margin of peduncle, inner ramus nearly as long as 1st joint of outer ramus.

No accessory branchiae.

Remarks.—This is a very interesting specimen. *G. pulex* extends right across the Palaearctic region from west to east (Tattersall 1922: Japan), and from low levels up to considerable altitudes (Chevreux 1908: Turkestan 10,500 ft.; Tattersall 1914: Pamirs 15,600 ft.). In spite of a certain amount of variability (see Chevreux *l. c.*) these records undoubtedly apply to *pulex* (see also Ueno *l. c.* p. 69).

Probably Giles' record (1888, *J. Asiat. Soc. Bengal* LVII, p. 220) of *G. fluviatilis* from the Pandar Lake, 11,000 ft. in the Hindu-Kush Range is also to be referred to this species.

Recently, however, Martynov has described a form from a locality in the basin of the River Lena in Siberia (presumably at or near sea-level), which he considers worthy of subspecific rank and has named *extensus* in allusion to the unusually elongate 2nd joints of peraeopods 3-5. Additional features are the 3-jointed accessory flagellum and the single spine at the end of each lobe of the telson.

It is particularly interesting to find this form at a high altitude in Tibet. From the above description it will be seen that the present ♀ specimen agrees with Martynov's ♂ specimens except in having fewer flagellar joints in both antennae (Martynov: ant. 1 28-29-jointed, ant. 2 16-jointed), and the slightly less elongate 2nd joint of peraeopod 5. These differences may well be sexual (*cf.* Ueno, *l.c.*).

Recently Ueno has reported on the abundant material collected by the Yale North India Expedition to Kashmir and Ladak. Ueno has discussed and figured several variable features, but apparently has not seen Martynov's 1932 description of the subsp. *extensus*; he finds that in general the 2nd joints of peraeopods 3-5 are narrower and more elongated in the specimens from lower altitudes in Kashmir than in those from the higher altitudes in Ladak.

G. annandalei Tattersall 1922, and *gregoryi* Tattersall 1924 also possess more elongate 2nd joints in peraeopods 3-5 than typical *pulex*, but are separated by other characters (*e.g.*, uropod 3). Both these species occur in Yunnan, Western China, at moderate altitudes, and Annandale (*l.c.*) mentions some specimens of *pulex* (identified by Stebbing) also from Yunnan. An overlapping of the distribution of these three species and the subspecies therefore seems to occur in the high Central Plateaux, and all opportunities should be taken of collecting as many examples as possible from different localities.

Eriopisa Stebbing.

1890. Stebbing, *Ann. Mag. Nat. Hist.* (6) V, p. 193.
 1894. Sars, G. O., *Crust. Norway I*, p. 514, pl. clxxxi.
 1931. Schellenberg, *Arch. Hydrobiol. Suppl. Bd. VIII*, p. 507.
 1933. *id.*, *Mitt. Zool. Mus. Berlin XIX*, pp. 407, 409.

Schellenberg has shown that "*Niphargus*" *chilkensis* Chilton 1921 and *philippensis* Chilton 1920 do not belong to the genus *Niphargus*. In fact it is strange that Chilton, having set out all the characters in which *chilkensis* differed from the diagnosis of *Niphargus*, should have completely ignored the genus *Eriopisa*.

While these two species are to be included in *Eriopisa*, two other species hitherto included in this genus, *viz.*, *sechellensis* Chevr. 1901 and *capensis* Brnrd. 1916, must be excluded and referred to another genus *Eriopisella* Chevr. 1920 (Schellenberg, *l.c.* 1933).

Eriopisa chilkensis (Chilton).

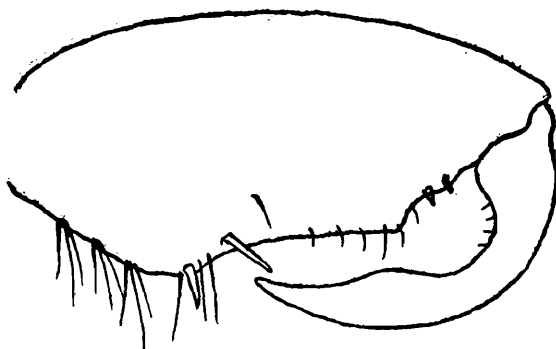
1921. Chilton, *Mem. Ind. Mus.* V, p. 531, fig. 4 (*Niphargus c.* ♂) [*non* Chilton, *Mem. Asiat. Soc. Bengal VI*, p. 534, fig. 1.]

Localities.—Salt Lakes, Lower Bengal. 23-24th February 1928. Dr. B. N. Chopra. A lot ♂♂ and juv. (2 tubes).

Salt Lakes, Lower Bengal. 9th March 1928. Dr. B. N. Chopra. 3 ♂♂.

Tiruppunithura, Cochin, amongst weeds in brackish channel on road to Travancore. H. S. Rao and M. Sharif. December 1927. 1♂.

Tirunayamkudam, Vembanad Lake, Travancore. H. S. Rao and M. Sharif. January 1928. 1 ovig. ♀.



TEXT-FIG. 3.—*Eriopisa chilensis* (Chilton). Inner view of gnathopod 2 ♂.

Remarks.—There are several ♂♂ and juveniles, but the only ovigerous ♀ is that from Vembanad Lake. A figure is given of the hand of gnathopod 2 of the largest ♂, measuring 12 mm. in length (uropods excluded).

The ♀ measures 4.5 mm. (excl. uropods) and carries 4 embryos. The 2nd gnathopod is shaped exactly like that of the ♂, but on a smaller scale, the palm is almost straight, and the finger is evenly curved. The 3rd uropods are exactly like those of the ♂.

One cannot be absolutely certain that the Talé Sap ♂ specimen (Chilton 1925) belongs to this species; the ♀♀ from the same area are *Eriopisella sechellensis* (*vide infra*).

Eriopisella Chevreux.

1920. Chevreux, *Bull. Soc. Zool. France* XLV, p. 81.

1925. Chevreux & Fage, *Faune de France, Amphip.*, p. 220.

1933. Schellenberg, *Mitt. Zool. Mus. Berlin* XIX, pp. 408, 409.

In addition to the species mentioned below, this genus contains *capensis* Brnrd. 1916, and *pusilla* Chevr. 1920. It is separated from *Eriopisa* by the acute antero-inferior angle of side-plate 1, the very slender mandibular palp, inner plate of maxilla 1 with 2-3 setae at apex only, inner plate of maxilla 2 narrow and without setae on inner margin, and the short almost styliiform 2nd joint of the outer ramus of 3rd uropod.

Eriopisella sechellensis (Chevreux).

1901. Chevreux, *Mem. Soc. Zool. France* XIV, p. 403, figs. 19-23. (*Eriopisa* s.)

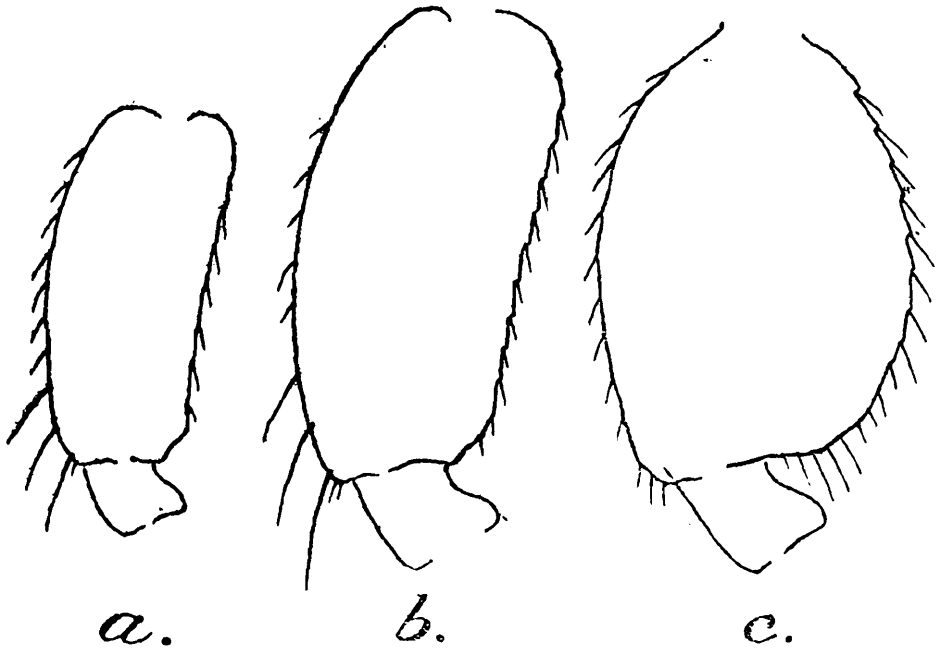
1925. Chilton, *Mem. Asiat. Soc. Bengal* VI, p. 534, fig. 1. (*Niphargus chilensis* ♀♀, non Chilton 1921.)

Locality.—In stake-net Manumbam Channel, Travancore. H. S. Rao. January 1928. 32 ♂♂, ovig. ♀♀, and juv.

Remarks.—Except that the 2nd joint of peraeopod 5 is rather broader than represented in Chevreux's figure, there are no distinguishing

features. The specimens measure up to 5.5 mm. in length; and are pale straw colour, the eyes reddish.

Distribution.—Seychelles; Talé Sap, Siam.



TEXT-FIG. 4.—*Eriopisella sechellensis* (Chevr.). a, b, c. 2nd joints of pereopods 3, 4, 5.

Maera othonides Walker.

1904. Walker, *Herdman's Ceylon Pearl Fish. Rep.* II, p. 271, pl. v, fig. 29.

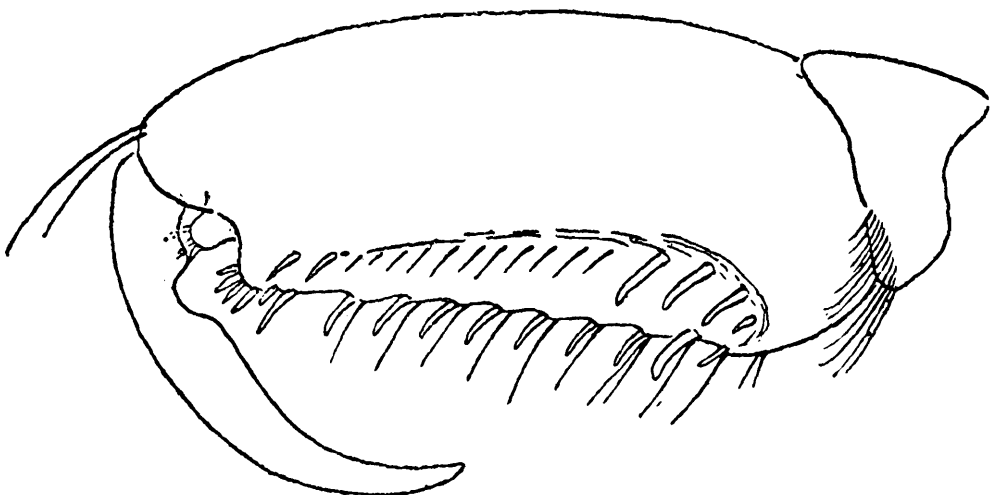
1905. *id.*, *Fauna Geogr. Mald. Laccad. Arch.* II, p. 927.

1921. Chilton, *Mem. Ind. Mus.* V, p. 535, fig. 5.

Localities.—In stake-net Manumbam Channel, Travancore. H. S. Rao. January 1928. 4 ♂♂, 1 juv.

Quilon, Travancore. H. S. Rao and M. Sharif. February 1928. 4 ♂♂, 2 ovig. ♀♀.

Cochin Harbour, S. India. H. S. Rao. December 1927 2 immat ♂♂, 1 ovig. ♀.



TEXT-FIG. 5.—*Maera othonides* Wlkr. Inner view of hand of gnathopod 2 of adult ♂.

Remarks.—Characteristic of this species are the densely pubescent hind half of body (pleon segments 1-6), the setae extending even on to

the telson, the pubescent 3rd uropods, the very stout 3rd joint of the mandibular palp (a feature also found in *Ceradocus rubromaculatus*), and the 2nd gnathopod of the adult ♂. A figure of the latter is here given.

Peraeopods 3-5, 2nd joint oblong, slightly narrowing distally in peraeopod 5, hind margin straight, feebly notched in peraeopod 3, distinctly so in peraeopod 4, and serrate in peraeopod 5, upper and lower hind corners quadrangular, the lower corners sharper than the upper ones. Length: 11 mm.

Distribution.—Ceylon; Maldive Archipelago; Chilka Lake.

Elasmopus Costa.

1932. Stephensen, *Annot. Zool. Jap.* XIII, p. 487 (synopsis of species).

Elasmopus subcarinatus (Haswell).

1904. Walker, *l.c.*, p. 275, pl. v, fig. 34.

1909. *id.*, *Trans. Linn. Soc. London* XII, p. 335.

1927. Gravely, *Bull. Madras Govt. Mus.* (n.s.) I, p. 123.

Locality.—Tuticorin Pearl Banks. B. Prashad. April 1927. 2 ♂♂.

Distribution.—Australia; New Zealand; Ceylon; Gulf of Manaar; Indian Ocean.

Pareiasmopus suluensis (Dana).

1888. Stebbing, *Challenger Rep.* XXIX, p. 1029, pl. c.

1901. Chevreux, *Mem. Soc. Zool. France* XIV, p. 412, figs. 32-39 (*setiger*).

1904. Walker, *l.c.*, p. 278, pl. vi, fig. 38.

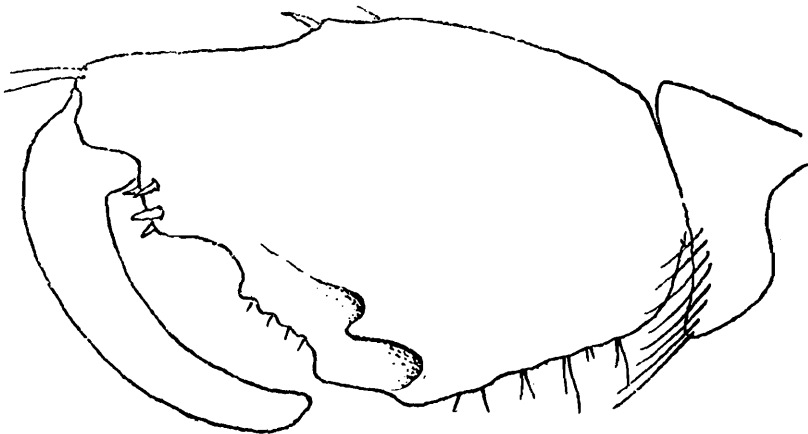
1905. *id.*, *l.c.*, p. 929.

1909. *id.*, *l.c.*, p. 334.

1922. Chilton, *K. Sv. Vet. Ak. Handl.* LXIII, 3, p. 7, fig. 3.

Locality.—Tuticorin Pearl Banks. B. Prashad. April 1927. 1 ♂, 2 ovig. ♀♀.

Remarks.—None of the specimens have setae on the peraeon or pleon segments. The ♂ (13 mm.) has a 3-jointed accessory flagellum, a blunt tip to the finger of gnathopod 2 (see also Walker 1909), palm



TEXT-FIG. 6.—*Pareiasmopus suluensis* (Dana). Inner view of hand of gnathopod 2 ♂.

oblique as in Stebbing's figure, peraeopods 3-5 densely setose (as in *setiger*), and each lobe of the telson with 4 spines (as in *setiger*).

The 2 ♀♀ (9 mm.) have both lost the 1st antennae, peraeopods 3-5 are not densely setose, telson as in ♂.

Walker (1904, p. 278, footnote) noted a certain intermingling of the characters of *suluensis* and *setiger*, and in view of the present specimens there can be but little reason for keeping the latter species separate.

Stebbing's statement in *Das Tierreich* (1906, p. 417) that the 4th pleon segment has *two* pairs of upturned teeth is evidently a slip.

Distribution.—Sulu Sea; Ceylon; Seychelles; Maldives and Laccadive Archipelago; Red Sea; British East Africa; N. W. Australia.

Quadrivisio Stebbing.

1907. Stebbing, *Rec. Ind. Mus.* I, p. 159.

1933. Stephensen, *Zool. Jahrb. Abt. Syst.* LXIV, p. 420.

Stephensen has described a second species of this genus from Bonaire Island, Dutch West Indies.

Quadrivisio bengalensis Stebbing.

1907. Stebbing, *l.c.*, p. 160, pl. vii.

1913. Chevreux, *Voy. Alluand & Jeannel Afr. Orient. Amphip.*, p. 15, fig. 1.

1921. Chilton, *Mem. Ind. Mus.* V, p. 537, fig. 6.

1925. *id.*, *Mem. Asiat. Soc. Bengal* VI, p. 534.

Localities.—Salt Lakes, Lower Bengal. Dr. B. N. Chopra. 23-24th February 1928. 2 ♂♂, 4 immature.

Isolated Pond, S. side Church Hill, Vizagapatam. H. S. Rao and G. Varugis. May, June 1926. A lot ♂♂.

Mundattalkari, Vaikom, Travancore. H. S. Rao and M. Sharif. January 1928. 1 ♂, 1 ♀.

Kurumbil Kayal, Travancore. H. S. Rao and M. Sharif. January 1928. 1 ♂.

Shertallai, Travancore. H. S. Rao and M. Sharif. February 1928. A lot ♂♂, ovig. ♀♀, and juv.

Veli Lake, Trivandrum, Travancore. M. Sharif. February 1928. 26 ♂♂, ovig. ♀♀, and juv.

Remarks.—The dorsal denticles on the pleon are certainly a variable feature, irrespective of sex; in mature specimens from one and the same locality, *e.g.*, Veli Lake and Shertallai, they are quite obsolete in some, in others strongly developed.

Distribution.—Port Canning (Lower Bengal); Chilka Lake; Talé Sap (S. E. Siam); British East Africa, Zanzibar.

Family TALITRIDAE.

Talitrus Latr.

1906. Stebbing, *Das Tierreich* XXI, p. 524.

1925. Hunt, *J. Mar. Biol. Assoc. Plymouth* XIII, p. 854.

1934. Burt, *Ceylon J. Sci.* (B) XVIII, p. 181.

1934. Carl, *Rev. Suisse de Zool.* XLI, p. 741.

Talitrus sp.

Locality.—Mule track between Mao-Hsao and Namkham, 3,700 ft., Northern Shan States, Burma. H. S. Rao. November 1926. 3♀♀.

Remarks.—With only three specimens, all ♀♀, I do not propose to attempt a specific determination. The genus has been recorded from Ceylon (Burt) and the Nilgiris (Carl), and representatives may be expected to be plentiful in the forest areas of Burma; future collecting will no doubt bring to hand more extensive material.

Orchestia Leach.

1906. Stebbing, *Das Tierreich* XXI, p. 530.

Judging from the figure of the 1st gnathopod ♀, I feel inclined to suggest that Tattersall's *Talorchestia japonica* (1922, *Mem. Asiat. Soc. Bengal* VI, p. 452, pl. xxi, figs. 1-10) is really an *Orchestia*, especially as Schellenberg (1931, *Arch. Hydrobiol. Suppl. Bd. VIII*, p. 498) has transferred even *malayensis* to the latter genus.

Orchestia platensis Kröyer.

1921. Chilton, *Mem. Ind. Mus.* V, p. 538, fig. 7 (references).

1928. Schellenberg, *Trans. Zool. Soc. London* XXII, p. 658.

1929. Tattersall, *Ann. Mag. Nat. Hist.* (10) III, p. 96.

1932. Barnard, *Discovery Rep.* V, p. 218.

1932. Schellenberg, *Zool. Anz.* CI, p. 61, fig. 1.

Locality.—Amongst fibres of rotting cocoanut tree on edge of back-water west of Manumbam, Travancore. H. S. Rao. January 1928. 3 ♂♂, 7 ♀♀.

Remarks.—The 2nd antennae of the ♂♂ are only slightly more robust than those of the ♀♀ (*cf.* Schellenberg, 1926, *Deutsch. Südpol. Exp.*, p. 371), though the 5th peraeopods show the normal moderate expansion of the 4th and 5th joints.

Orchestia floresiana Weber.

1922. Tattersall, *Mem. Asiat. Soc. Bengal* VI, p. 453, pl. xxi, figs. 11-20 (*malayensis*).

? 1925. *id.*, *Rec. Ind. Mus.* XXVII, p. 241 (*malayensis*).

1931. Schellenberg, *Arch. Hydrobiol. Suppl. Bd. VIII*, p. 498 (var. *thienemanni*).

1935. Stephensen, *Bull. B. P. Bishop Mus.* No. 142, p. 24, figs. 4-6.

Locality.—Salt Lakes, Lower Bengal. Dr. B. N. Chopra. 23-24th February 1928. 3 ♂♂, 14 ♀♀.

Remarks.—The scabrous knob on the 4th joint (merus) of gnathopod 1 ♂, and the very numerous and regular serrulations on hind margin of 2nd joint of peraeopod 5 are characters of this species.

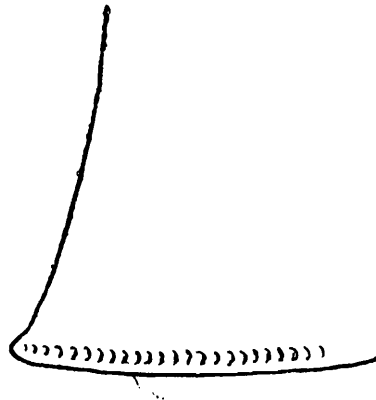
In the present specimens the 6th joint of gnathopod 1 ♀ does not narrow evenly (as in *T. martensii*, see Chilton, *l.c.*, 1921, fig. 8e), but is parallel-sided for about $\frac{1}{2}$ its length, where the lower distal angle is bevelled off (*cf.* Schellenberg, fig. 2 m.); the base of the finger is half the width of the 6th joint. The latter can scarcely be called "strictly simple", but it has no definite rounded lobe as figured for *japonica* (Tattersall, 1922, *l.c.*, pl. xxi, fig. 1).

The telson is not so shortly triangular as in Tattersall's figure, and the flagellum of antenna 1 is 3-4-jointed in ♀, 4-5-jointed in ♂. The peduncle of uropod 1 usually has 5 spines, but there may be only 4,

or sometimes a small 6th spine. The outer ramus of uropod 2 has only 2 spines.

The fewer indents (19-20 instead of about 30) on hind margin of 2nd joint of peraeopod 5, and greater number of spines on the uropods are characters found both in the Javanese variety and the Andaman specimens.

Along the lower margins of pleon segments 2 and 3 is a series of minute submarginal ridges giving a crimped appearance. This sculpturing



TEXT-FIG. 7.—*Orchestia floresiana* Weber. Postero-inferior angle of pleon segment 3.

can be seen by transmitted light, but is best observed by reflected light on a dried specimen. This feature is not mentioned in the original description, or by Schellenberg, consequently the type specimens of both *malayensis* and var. *thienemanni* should be re-examined. Similar sculpturing occurs in the South African species *Talorchestia ancheidos*.

Since this was written, Stephensen (*l. c.*) has figured this curious feature.

Length: ♂ 8-9 mm., ♀ 9-10 mm.

Distribution.—Singapore; ?Andaman Islands. The variety *thienemanni* was described from Java.

Talorchestia Dana.

- 1906. Stebbing, *Das Tierreich* XXI, p. 543.
- 1922. Tattersall, *Mem. Asiat. Soc. Bengal* VI, p. 452.
- 1925. Chilton, *China J. Sci. Art.* III, p. 283.

Tattersall in his key (pp. 454, 455) has accidentally transposed *australis* and *ancheidos*: and assumed that side-plates "2-4" are without a well-marked lobe on hind margin in *australis*, whereas my description only mentioned side-plate 2. As a matter of fact the character should not be used, as the lobe is present in *australis* as in other species, but is inconspicuous.

Talorchestia martensii (Weber).

- 1921. Chilton, *Mem. Ind. Mus.* V, p. 541, fig. 8.
- 1925. *id.*, *Mem. Asiat. Soc. Bengal* VI, p. 535 (referred to *gracilis*).
- 1927. Gravely, *Bull. Madras Govt. Mus.* (n.s.) I, p. 123 (identified as *gracilis* by Chilton).

Localities.—In pools close to Harbour Railway, Vizagapatam. H. S. Rao and G. Varugis. May, June 1926. A lot ♂♂, ♀♀, and juv.

Manakudi, Travancore. M. Sharif. February 1928. A lot ♂♂, ♀♀, and juv.

Chembu, Vembanad Lake, Travancore. H. S. Rao and M. Sharif. January 1928. 5 ♂♂, 6 ♀♀.

Remarks.—These specimens agree with the Chilka Lake form figured by Chilton. I am not prepared to follow Chilton in identifying this form with Dana's *gracilis*. If Bate's figure (*Cat. Amph. Brit. Mus.* 1862, pl. ii, fig. 5) of Dana's species is correct (I have not seen Dana's original figure), there is the difference in the breadth of the 2nd joints of peraeopods 3-5, a character utilised by Stebbing (1906) in his key. Chilton may be correct, but one would like a little more evidence.

The hind margin of pleon segment 3 has a few minute serrations, thus Tattersall's key (1922, p. 454) breaks down on this character. The distinction between *japonica* Tattersall and *martensii* seems to be in the relative breadth of 2nd joint of gnathopod 2 ♂ and the shape of 2nd joint of gnathopod 2 ♀; the former is much narrower in *martensii*, and the latter has the greatest width about the centre in *martensii*, but near the base in *japonica*.

There is no crimping or sculpturing near lower margins of pleon segments 2 and 3 in the present specimens.

Distribution.—Flores, East Indies; Chilka Lake. Also Gulf of Manaar and Talé Sap, Siam.

Parorchestia Stebbing.

1906. Stebbing, *Das Tierreich* XXI, pp. 557, 735.
 1909. Chilton, *Subantarctic Is. N. Zeal.*, p. 636.
 1915. Chevreux in Sarasin & Roux, *Nova Caled. Zool.* II, p. 8.
 1915. Baker, *Phillip. J. Sci.* X, p. 252.
 1916. Barnard, *Ann. S. Afr. Mus.* XV, p. 226.

Baker's two species *luzonensis* and *lagunae* would seem to be the ♀ and ♂ respectively of one and the same species (*luzonensis*). I have not seen Chevreux's work (*P. sarasini* and *pusilla*).

Parorchestia notabilis, sp. nov.

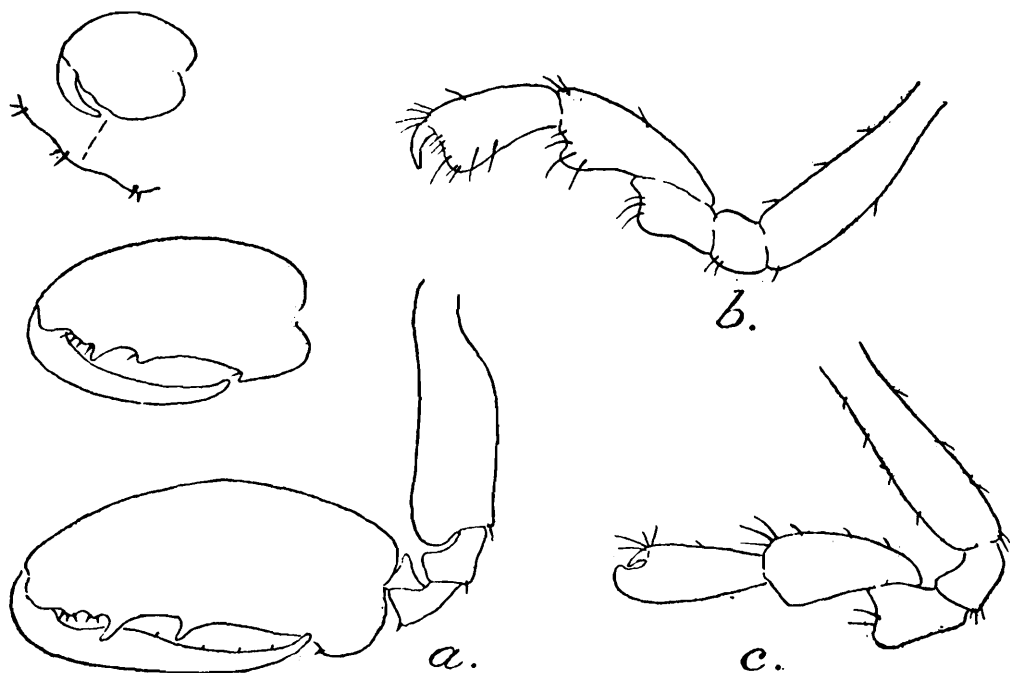
Localities.—From rotten screw-pine, Vypin, Cochin State. H. S. Rao. January 1928. 30 ♂♂, 42 ovig. ♀♀, 7 juv.

Cheppanam, Cochin State. H. S. Rao. January 1928. 6 ♂♂, 11 ♀♀.

Cheriya Kadamakudi, Cochin. H. S. Rao. January 1928. 4 ♂♂, 4 ovig. ♀♀.

Description.—Eyes large, subcircular, narrowly separated dorsally. Side-plate 1 smaller than and partly concealed by side-plate 2, 2-4 with small projection on hind margin, lower margins of 1-4 with minute and widely spaced spinules. Postero-inferior angle of pleon segment 3

quadrate with small blunt point, margin above smooth. Telson sub-triangular, the apex rounded-truncate, with 2-3 setae at each corner.



TEXT-FIG. 8.—*Parorchestia notabilis*, sp. nov. *a.* stages in growth of hand of gnathopod 2 of males respectively 3, 5, and 10 mm. in length; *b.* gnathopod 1 ♀; *c.* gnathopod 2 ♀.

Antenna 1 reaching slightly beyond apex of peduncle of antenna 2, 2nd and 3rd peduncular joints subequal, each slightly longer than 1st, flagellum 8-10-jointed. Antenna 2 about $\frac{1}{3}$ length of body, 4th peduncular joint about $\frac{2}{3}$ length of 5th, flagellum 12-jointed. Mouth-parts typical.

Gnathopod 1 typical, stronger in ♂ than ♀. Gnathopod 2 ♀ typical. In ♂ strongly developed, 6th joint ovate, the straight palm occupying the greater part of hind margin, from which it is separated by a slight step, one conical tooth in middle of palm, a slightly larger one distally, and 2 small rounded projections between the latter and the hinge, inner margin of finger sinuous.

Peraeopods 3-5, 2nd joints broadly oval, hind margins with slight and widely-spaced setiferous indents. Fingers of all peraeopods not markedly constricted.

Uropods 1 and 2, marginal spines fewer on the outer than on the inner rami. Uropod 3, peduncle with 1 stout spine on outer margin, ramus shorter than peduncle, tipped with 4-5 setae.

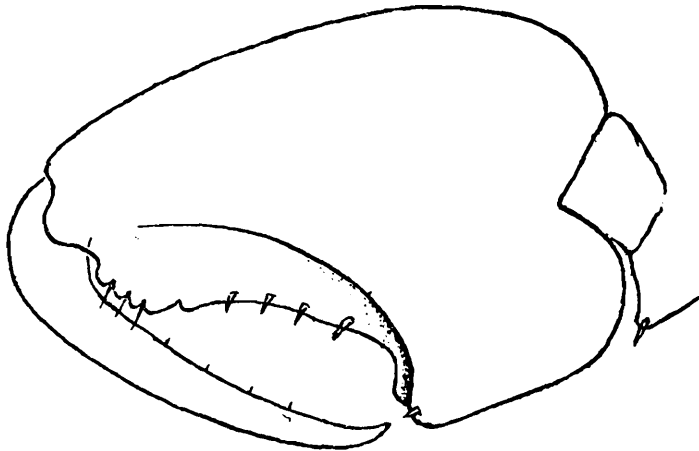
Length: ♂ 9-10 mm., ♀ (ovig.) 5-7 mm. Straw coloured, eyes black.

***Parorchestia* sp.**

Locality.—Port Blair, St. B 7, Andaman Islands. Dr. S. W. Kemp.

Remarks.—One ♂ 6.5 mm., 3 ovig. ♀♀ largest 5.5 mm., and 4 juv. ♂♂ are to be referred to a species of this genus, but I do not feel inclined on

such scanty material to apply a specific name. A figure of the hand of gnathopod 2 ♂ is given.



TEXT-FIG. 9.—*Parorchestia* sp. Port Blair, Andaman Is. Outer view of gnathopod 2 ♂.

Hyale Rathke.

1906. Stebbing, *Das Tierreich* XXI, pp. 559, 735.

The series of specimens from the following localities provides an interesting problem in systematics, the solution of which must await the comparison of material from more numerous localities. Although here recorded as forms of one species, mainly in deference to Schellenberg's 1928 opinion (*vide infra*), I incline to the opinion that two distinct species should be recognized.

Hyale brevipes Chevr.

Typical form (cf. Chilton's figures).

1901. Chevreux, *Mem. Soc. Zool. France* XIV, p. 400, figs. 15-18.

1903. Walker & Scott, *Nat. Hist. Sokotra*, p. 219, pl. xiv a, fig. 3 a-e (*nilssonii* non Rathke).

1921. Chilton, *Mem. Ind. Mus.* V, p. 545, fig. 9.

1925. *id.*, *Mem. Asiat. Soc. Bengal* VI, p. 536.

1933. Shoemaker, *Amer. Mus. Novit.* No. 598, p. 18, figs. 10, 11.

Locality.—Large creek close to Tumidalametta Hill, 336 ft., Vizagapatam. H. S. Rao and G. Varugis. May, June 1926. A lot ♂♂, ovig. ♀♀, and juv.

Remarks.—Antennae shorter than in the descriptions of Chevreux and Chilton, the 2nd antennae being equal to the head plus first 2 pereaeon segments; flagellum of antenna 1 8-jointed, of antenna 2 8-10-jointed.

Gnathopod 1 as in Chilton's figure of ♀ (9 d), but 6th joint broader in proportion to length in ♂ than in ♀; anterior apex of 2nd joint not prominent. Finger in ♂ tapering evenly, not abruptly narrowed (aquiline) as in Chevreux's fig. 18.

Gnathopod 2, 2nd joint with anterior apex not so prominently lobed, especially in ♀ where it is merely rounded; 6th joint in ♀ as in Chilton's fig. 9 e, with a very slight indent on hind margin; 6th joint in ♂ as here figured for the aquiline form (fig. 10 d), the palm defined by a definite though blunt angle, with 2-3 stout spines.

Hind margin of 6th joint of peraeopod 5 with a single fine setule at about $\frac{3}{4}$ its length (in peraeopod 4 3-4 such setules).

Length 5-6 mm. (♀♀ smaller than ♂♂).

Distribution.—Seychelles; Sokotra; Red Sea; Ceylon; Maldive Archipelago; Talé Sap, Siam; West Indies.

AQUILINE FORM.

1928. Schellenberg, *Trans. Zool. Soc. London XXII*, p. 658.

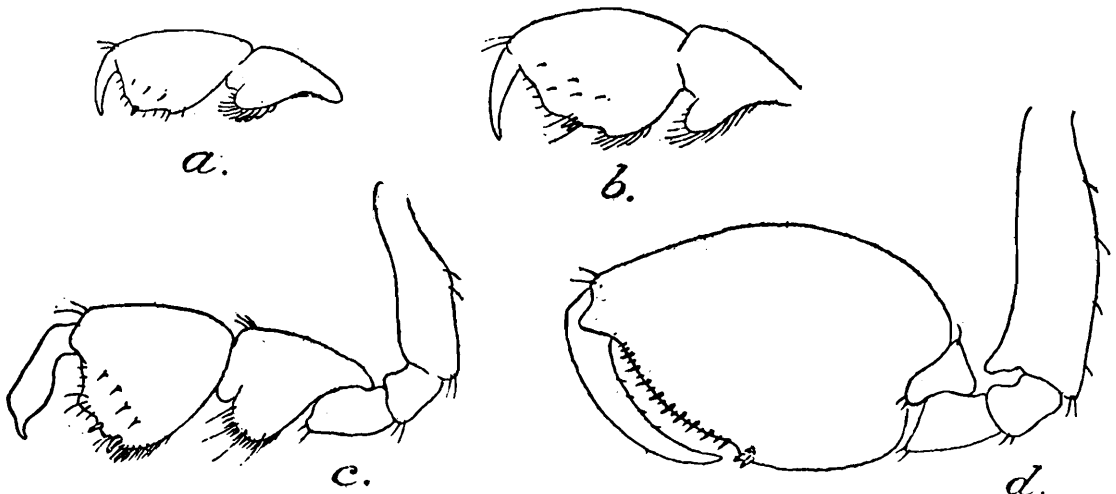
Localities.—Kayankulam Bar, Travancore. H. S. Rao and M. Sharif. February 1928. A lot ♂♂, ovig. ♀♀, and juv.

Tannirmukkam, Vembanad Lake, Travancore. H. S. Rao and M. Sharif. January 1928. A lot ♂♂, ovig. ♀♀, and juv.

Cheppanam, Cochin State. H. S. Rao. January 1928. 1♂, 1♀.

Chellanum, Cochin State. H. S. Rao. January 1928. A lot ♂♂, ovig. ♀♀, and juv.

Remarks.—As far as can be judged in the absence of figures, Schellenberg's Suez Canal specimens are very like the present specimens. The former, however, have the finger of gnathopod 1 ♂ thick but "symmetrically-formed", and thus lack one of the features which are so distinctive of the latter specimens, and which has suggested the name given above to this form.



TEXT-FIG. 10.—*Hyale brevipes* Chevr. Aquiline form. a, b. 1st and 2nd gnathopods ♀; c, d. 1st and 2nd gnathopods ♂, the latter in inner view to show apex of 5th joint.

The aquiline finger and the broad hand of gnathopod 1 ♂, and the hands of both gnathopods 1 and 2 ♀ in the present specimens show an extraordinary resemblance to those of *Allorchestes aquilinus* (Costa). There is also the same sexual difference in the maxilliped, though the flagellum of antenna 2 is shorter (16-jointed) than in the description of Chevreux and Fage (1925, *Faune de France, Amphip.*, p. 289, figs. 300, 301).

In two points, however, they differ: *A. aquilinus* apparently has no armature on the hind margin of 6th joint of peraeopod 5, whereas our specimens have 2 groups of 2-3 stout spinules (less marked in ♀ than in ♂); secondly (and this is a generic difference between *Allorchestes* and *Hyale*) the 5th joint of gnathopod 2 ♂ has only a very short blunt

lobe on inside, whereas in *aquilinus* it is produced as a distinct, though narrow process between the 4th and 6th joints.

The typical form and the aquiline form differ markedly in the armature of the hind margin of 6th joint of peraeopod 5, and in gnathopod 1 ♂ and both gnathopods ♀.

Differences in length of the antennae are perhaps of no great importance (*vide supra*), and it remains to be determined to what extent they vary in different colonies or localities.

The only facts which might be claimed as showing a transition between the two forms are: on the one side Schellenberg's description of the symmetrically formed finger of gnathopod 1 ♂, and on the other side Chevreux's figure of the same joint in his original description of *brevipes* (*l.c.*, fig. 18).

I submit, however, that these are outweighed by the differences, and that the aquiline form here figured should be given a specific name, unless it can be proved that the "aquiline" form is but the fully developed stage of the "typical" form, in which case the difference in the hind margin of 6th joint of peraeopod 5 (a character used in the specific diagnoses of other species also) must go by the board.

Length 6-7 mm. (♀♀ smaller than ♂♂).

Parhyalella Kunkel.

1910. Kunkel, *Trans. Connect. Ac. Sci.* XVI, p. 74.

1917. Stebbing, *Ann. Mag. Nat. Hist.* (8) XX, p. 435. (*Exhyalella*.)

1925. Barnard, *Ann. S. Afr. Mus.* XX, p. 359.

The genus contains one species from Bermuda and one from Natal. Its presence in India is interesting, though not unexpected.

Parhyalella indica, sp. nov.

Locality.—Tuticorin Harbour, shore collecting. H. S. Rao. February, March 1926. ♂♂, ovig. ♀♀, and juv.

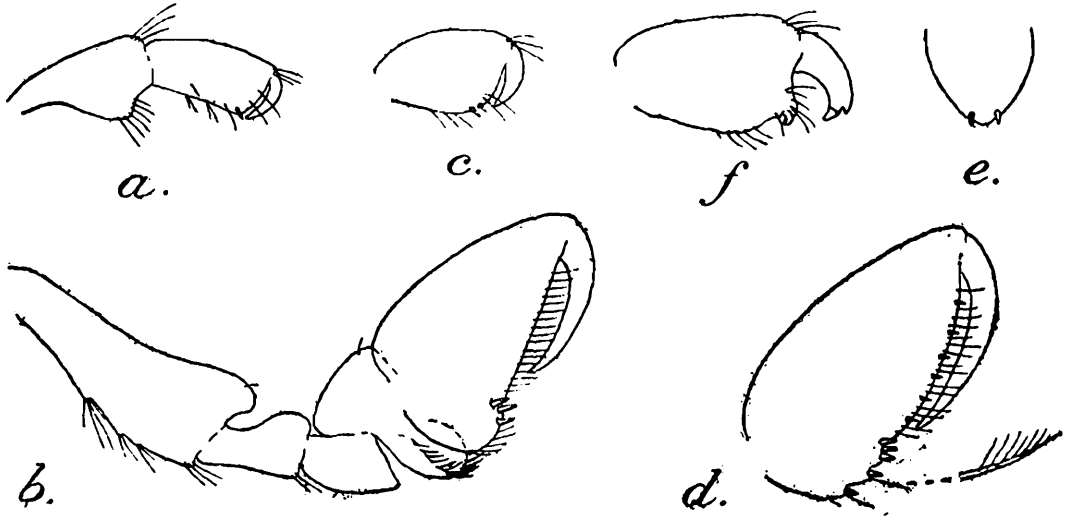
Description.—In general very like *natalensis* (Stebb.) and differing only in a few characters, which may later prove to be unimportant, but to which it is desirable to draw attention.

Flagella of both antennae 13-14-jointed (*natalensis*: 17-18).

Gnathopod 1. In the ♂ the palm is more convex than in ♀, defined by 2 spines. In none of the present specimens does the 6th joint show the peculiarities of the *fully developed* ♂ of *natalensis*, a figure (fig. 11 f) of which is given here for comparison.

Gnathopod 2. The lobes on the anterior apices of 2nd and 3rd joints are better developed in ♀ than in ♂, especially that on the 2nd joint, as is also the case in *natalensis*. The 6th joint has a slightly convex palm in ♂, furnished with spines and setae; in the ♀ the palm is straight and is furnished with a dense brush of setae; in both sexes the palm is defined by a slight notch and 3 spines, posterior to which in ♂ there are 2 more notches, each with a spine and seta; except that the palm is more densely setose in both ♂ and ♀ *natalensis*, the present specimens are in close agreement, but whereas in ♂ *natalensis* the palmar

setae are perfectly simple, in *indica* both those on the palm and posterior to it are unilaterally plumose.



TEXT-FIG. 11.—*Parhyalella indica*, sp. nov. a, b. 1st and 2nd gnathopods ♀; c, d. hands of 1st and 2nd gnathopods ♂; e. telson; f. hand of gnathopod 1 ♂ of *P. natalensis* (Stebb.) for comparison.

Peraeopods 3-5, 2nd joint less broadly expanded than in *natalensis*.

Telson obtusely ovoid (when flattened), bearing 2 spinules near the apex (as in *natalensis*).

Length 7-8 mm. Colour (as preserved) uniform whitish, eyes black.

Remarks.—It is quite likely that this species will be merged in *natalensis* later, as both occur in the same faunal region. Nevertheless they are separated by a big distance, and for the present it is preferable to insist on even small structural differences.

Stebbing's figures of *natalensis* (*Ann. Durban Mus.* II, pl. xi, 1918) seem to have suffered in the course of lithographing and printing, and the present opportunity is taken of giving a figure of the peculiar hand of gnathopod 1 of the ♂; the other figures here given will also apply to *natalensis*, bearing in mind the points of difference set out above.

Family AORIDAE.

Grandidierella Coutière.

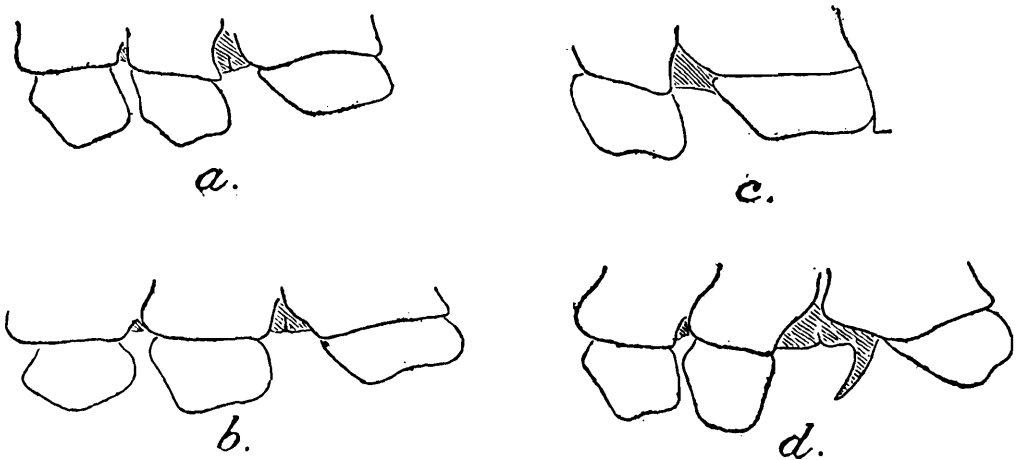
1904. Coutière, *Bull. Soc. Philomath. Paris* (9) VI, pp. 166, 173.
 1908. Stebbing, *Rec. Ind. Mus.* II, p. 120.
 1921. Chilton, *Mem. Ind. Mus.* V, p. 548.
 1925. Chevreux, *Bull. Soc. Zool. France* L, p. 392.

It is with regret that I feel obliged to reopen the question of the synonymy of *G. magna* (Giles), which Chilton had, apparently so satisfactorily, settled. Eventually perhaps we may unite the several forms under one specific name with varietal names, but for the present I submit that this is another case where the recording of forms from different localities under one name, without even varietal names, is certain to lead to trouble.

Whether in carrying out this principle of recording the forms under separate names, I have myself erred in assigning Chilton's form 1 (1921)

to Stebbing's *bonnieri*, Tattersall's (1922) Chinese specimens to *megnae*, and Chilton's (1925) Talé Sap form to a new species, must be decided by other students. Tattersall (1922) accepts Chilton's synonymy, and says that all his Chinese specimens belong to Chilton's form 1; but there are obvious differences in his figures. He alone up to the present seems to me to have had the true *megnae* of Giles.

In the specimens here assigned to *bonnieri*, there are ventral (sternal) spiniform processes on two of the peraeon segments in the adult ♂, a feature which is paralleled by certain species of other genera in this family (e.g., *Lembos* and *Lemboides*). On the other hand no such processes are found in the form described as *gravipes*, nor in *gilesi*. Examples of *macronyx* (Chilton's form 2), the Chinese *megnae*, and *mahafalensis* should be examined for this character.



TEXT-FIG. 12.—*Grandidierella* Males. a. side-plates 1-3 of *gilesi* Chilton; b. the same of *gravipes*, sp. nov.; c. side-plates 1 and 2 of *mahafalensis* Cout. (drawn from Coutière 1904); d. side-plates 1-3 of *bonnieri* Stebb.

Another feature, to which Giles, Stebbing and Schellenberg have referred, is the shape of the side-plates. I give figures of those of the three forms here examined, to show how largely they may differ. It will be observed that those of the form here identified with *bonnieri* agree well with Stebbing's upper figure (♂), except the 3rd side-plate. Stebbing, however, seems to have based his description on the ♀, where the side-plates in all the species are less distinctive than in the ♂. None of the present specimens will fit Giles' figure, nor his description of the 3rd side-plate as being the deepest.

While dealing with this genus, the opportunity is taken of including the description of a South African new species. This species also shows distinctively shaped side-plates in ♂, associated with a 1st gnathopod which, though built on the same plan as that of *bonnieri*, nevertheless differs in detail.

In view of these facts, it is merely confusing to speak of one variable "species" widely distributed over the tropical and subtropical regions; and it is even possible that a more detailed study and comparison will reveal that the Cameroon and Dutch West Indies specimens are specifically separable without incurring the criticism of "splitting".

The following synopsis of the species seems to show that they are easily run down and well distinguished :—

- I. Ocular lobes short, obtuse. 6th joint gnathopod 2 ♂ with straight or convex palm.
- A. 6th joint gnathopod 1 ♂ broad, ovoid or sub-quadrangular.
1. 6th joint gnathopod 2 ♂ distinctly widened to palm. 6th joint gnathopod 1 ♀ smaller than the trapezoidal 5th joint *megnae* (Giles).
 2. 6th joint gnathopod 2 ♂ parallel-sided. 6th joint gnathopod 1 ♀ larger than the triangular 5th joint. Uropod 3 ♂ uncinately curving outwards *gravipes*, sp. nov.
- B. 6th joint gnathopod 1 ♂ narrow, at least at base. 6th joint gnathopod 2 ♂ nearly or quite parallel-sided.
1. 4th joint gnathopod 2 ♂♀ not prominent. 6th joint gnathopod 2 ♂ shorter than 5th, nearly parallel-sided.
 - a. 2nd joint gnathopod 1 ♂ moderate, nearly parallel-sided, cross-section subtriquetral.
 - i. Side-plates 1 and 2 ♂ with even margins.
 - a. A medio-ventral spine on pereon segments 1 and 2 ♂ *bonnieri* Stebb. (Chilton's form 1).
 - b. Ventral spines ? *mahafalensis* Coutière.
 - ii. Side-plates 1 and 2 ♂ with pointed projections on lower margins. No ventral spines *lignorum*, sp. nov. (S. Africa).
 - b. 2nd joint gnathopod 1 ♂ robust, ovoid, cross-section ovoid. 7th joint long *macronyx*, sp. nov. (Chilton's form 2).
 2. 4th joint gnathopod 2 ♂♀ prominent. 6th joint gnathopod 2 ♂♀ equal to 5th, parallel-sided. 4th-6th joints with long plumose setae *gilesi* Chilton.
- II. Ocular lobes produced, subacute. 6th joint gnathopod 2 ♂ with concave palm *elongata* Chevreux. (Senegal).

Grandidierella meгнаe (Giles).

1888. Giles, *J. Asiat. Soc. Bengal* LVII, p. 231, pl. vii, figs. 1-4.

1922. Tattersall, *Mem. Asiat. Soc. Bengal* VI, p. 455, pl. x, figs. 1-12.

There are no examples of this species in the present collection.

Gnathopod 1 ♂, 2nd joint robust, a single (apparently) spinous process at inner apex of 5th joint, 6th joint broad, 7th subequal in length to 6th; in ♀ 5th joint trapezoidal (somewhat broadly rounded on inner margin in Tattersall's figure), 6th joint not longer than 5th, distinctly widened towards the moderately oblique palm.

Gnathopod 2 ♂, 6th joint distinctly widened towards the palm.

Distribution.—Megna Flats, Bay of Bengal; China.

Grandidierella gravipes, sp. nov.

1925. Chilton, *Mem. Asiat. Soc. Bengal* VI, p. 536, fig. 2 (*megnae* non Giles).

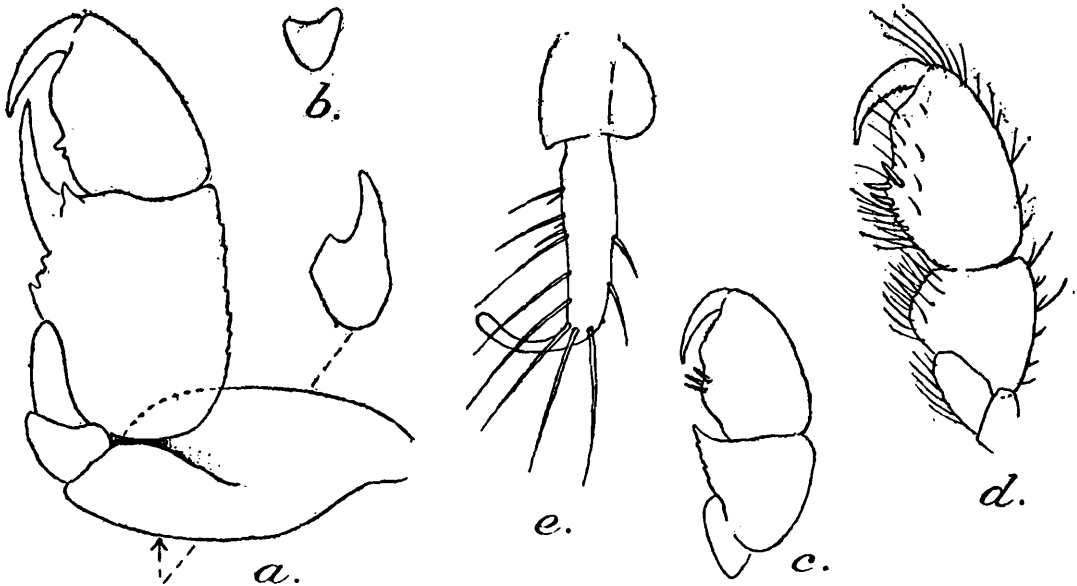
? 1925. Schellenberg, *Kenntn. Meeresf. Westaf.* III, *Amphip.*, p. 166, fig. 17 (*megnae* Chilton, non Giles).

Localities.—Vembanad Lake, Travancore. H. S. Rao and M. Sharif. January 1928. 22 ♂♂, ovig. ♀♀, and juv.

Mundattalkari, Vaikom, Travancore. H. S. Rao and M. Sharif. 12 ♂♂, ♀♀, and juv.

Description.—No ventral spiniform processes in ♂. Ocular lobes obtuse. Antennae strongly setose.

Gnathopod 1 ♂, 2nd joint robust, ovoid, lower margin rounded, inner upper edge expanded, outer upper edge obsolete except distally, between the ridges a concavity into which the 5th joint fits when the limb is retracted, cross-section ovoid (fig. 13 *a*); 5th joint flat or slightly concave on inner face, convex externally; upper margin with minute setiferous notches, the smaller of the two spinous processes at the inner apex is on the outer surface (and liable to be overlooked), the larger on the inner surface; 6th joint almost as broad at base as distal width of 5th joint, the two joints together when extended almost lanceolate in shape (disregarding the big process of 5th joint); 7th shorter than 6th. In young ♂ the gnathopod is very similar to that of ♀ (6th joint larger than 5th), but with indication of the development of the big process on inner apex of 5th joint. Gnathopod 2 ♂ with 6th joint parallel-sided.



TEXT-FIG. 13.—*Grandidierella gravipes*, sp. nov. *a.* outer view of gnathopod 1 adult ♂ (setae omitted) with cross-section of 2nd joint at level of arrow; *b.* cross-section of same joint of *bonnieri* for comparison; *c.* gnathopod 1 of young ♂; *d.* gnathopod 1 ♀; *e.* uropod 3 ♂.

Gnathopod 1 ♀, 5th joint subtriangular, inner margin rounded, 6th joint longer and larger than 5th, palm very oblique, sinuous, with 3 stout spines at defining angle, 7th with inner margin serrulate.

Uropod 3♂, apex of ramus uncinately curved outwards, thin, transparent, and slightly spatulate.

Remarks.—Gnathopod 1 is distinctive in both sexes. In no other species is the 6th joint in ♀ longer and larger than the 5th.

As regards the 3rd uropod in ♂, Stebbing (1908, p. 123, pl. vi, urp. 3) mentioned that one of his ♂ specimens had the ramus curved *inwards*; although the curvature was symmetrical on both sides, he considered it abnormal. I did not find a similar curved ramus in any of the specimens here assigned to *bonnieri*; and it can in no way be confused with the very distinctive form of ramus exhibited by every adult ♂ of the present species.

Schellenberg's original intention of describing his Cameroon specimens as distinct from *megnae* was certainly correct; but I would not like to say whether they are conspecific with the Indian form here described.

Distribution.—Talé Sap, Siam; ? Cameroon.

Grandidierella bonnieri Stebbing.

1908. Stebbing, *Rec. Ind. Mus.* II, p. 120, pl. vi.

1921. Chilton, *Mem. Ind. Mus.* V, p. 548, figs. 10 a-l (form 1; *megnae*, non Giles).

? 1933. Stephensen, *Zool. Jahrb. abt. Syst.* LXIV, pp. 434, 446.

Localities.—In pools close to Harbour Railway, Vizagapatam. H. S. Rao and G. Varugis. May, June 1926. Several ♂♂ and ovig. ♀♀, more or less mutilated.

West Narakkal, Cochin. H. S. Rao. January 1928. 1 ♂ 7 mm. 1 ovig. ♀ 5.5 mm., 3 juv.

Kayankulam Kayal, Travancore. H. S. Rao and M. Sharif. February 1928. 1 immat. ♂, 12 ovig. ♀♀, 1 juv.

Among weeds in brackish channel on road to Tiruppunithura, Cochin. H. S. Rao and M. Sharif. December 1927. 29 ♂♂, ovig. ♀♀, and juv.

In mud opposite Vizag. railway station, Vizagapatam. H. S. Rao and G. Varugis. May, June 1926. A lot ♂♂, ovig. ♀♀, and juv.

Kayankulam Bar, Travancore. H. S. Rao and M. Sharif. February 1928. 2 ♂♂, 8 ovig. ♀♀, 2 juv.

Manakudi, Travancore. M. Sharif. February 1928. 8 ♂♂, 6 ovig. ♀♀.

Description.—A medio-ventral spiniform, backwardly directed process on peraeon segment 1 in (adult) ♂, and a smaller one on segment 2.

Gnathopod 1 ♂, 2nd joint moderate, nearly linear (not ovoid), lower margin rounded, upper margin keeled along both inner and outer edges, the former not expanded and raised as in *gravipes*, cross-section therefore triquetral (fig. 13 b); 5th joint not narrowing distally, a strong spinous projection on inner apical corner, a smaller one on distal margin, and a small one on lower margin at about $\frac{2}{3}$ length; 6th joint narrow at base, distally somewhat expanded and rounded; 7th not longer than 6th, somewhat expanded on inner margin proximally, outer margin nearly straight.

Gnathopod 1 ♀, 5th joint trapezoidal, 6th shorter than 5th, ovoid, palm very oblique.

Gnathopod 2 ♂♀, 6th joint almost parallel-sided.

Remarks.—Stephensen says (*l.c.*, p. 434) the Dutch West Indies specimens were not dissected, but had gnathopod 1 and other limbs not different from Stebbing's figure. Nevertheless I think they should be re-examined.

Distribution.—Port Canning, Bengal; Chilka Lake; Bonaire and Curaçao, Dutch West Indies.

Grandiderella macronyx, sp. nov.

1921. Chilton, *Mem. Ind. Mus.* V, p. 548, figs. 10 m, n, o. (form 2; part *magna*, non Giles).

Description.—Gnathopod 1 ♂, 2nd joint robust, 5th slightly narrowing distally, spinous process on distal margin much larger than that on inner distal angle; 6th joint narrow, inner distal margin with angular tooth; 7th longer than 6th. Gnathopod 2 ♂ and gnathopods 1 and 2 ♀?

Distribution.—Chilka Lake.

Grandiderella gilesi Chilton.

1921. Chilton, *Mem. Ind. Mus.* V, p. 552, fig. 11.

1925. *id.*, *Mem. Asiat. Soc. Bengal* VI, p. 537.

Localities.—Large creek close to Tumidalametta Hill, 336 ft. Vizagapatam. H. S. Rao and G. Varugis. May, June 1926. 1 ♀.

On stake-net, Manumbam channel, Travancore. H. S. Rao. January 1928. A large number ♂♂, ovig. ♀♀, and juv.

Remarks.—No ventral spiniform processes on peraeon segments in ♂.

Distribution.—Chilka Lake; Talé Sap; Patani River, Siamese Malay States.

Grandiderella mahafalensis Coutière.

1904. Coutière, *l.c.*, pp. 166-173, figs. 1-19.

I have interpolated this species where it apparently belongs in the key, and give a figure of the side-plates 1 and 2 ♂ enlarged from Coutière's very small habitus figure. These plates clearly differ from those of the specimens here assigned to *bonnierii*. The really conclusive criterion as to the distinctness of these species is the presence or absence of sternal spines.

Distribution.—Madagascar.

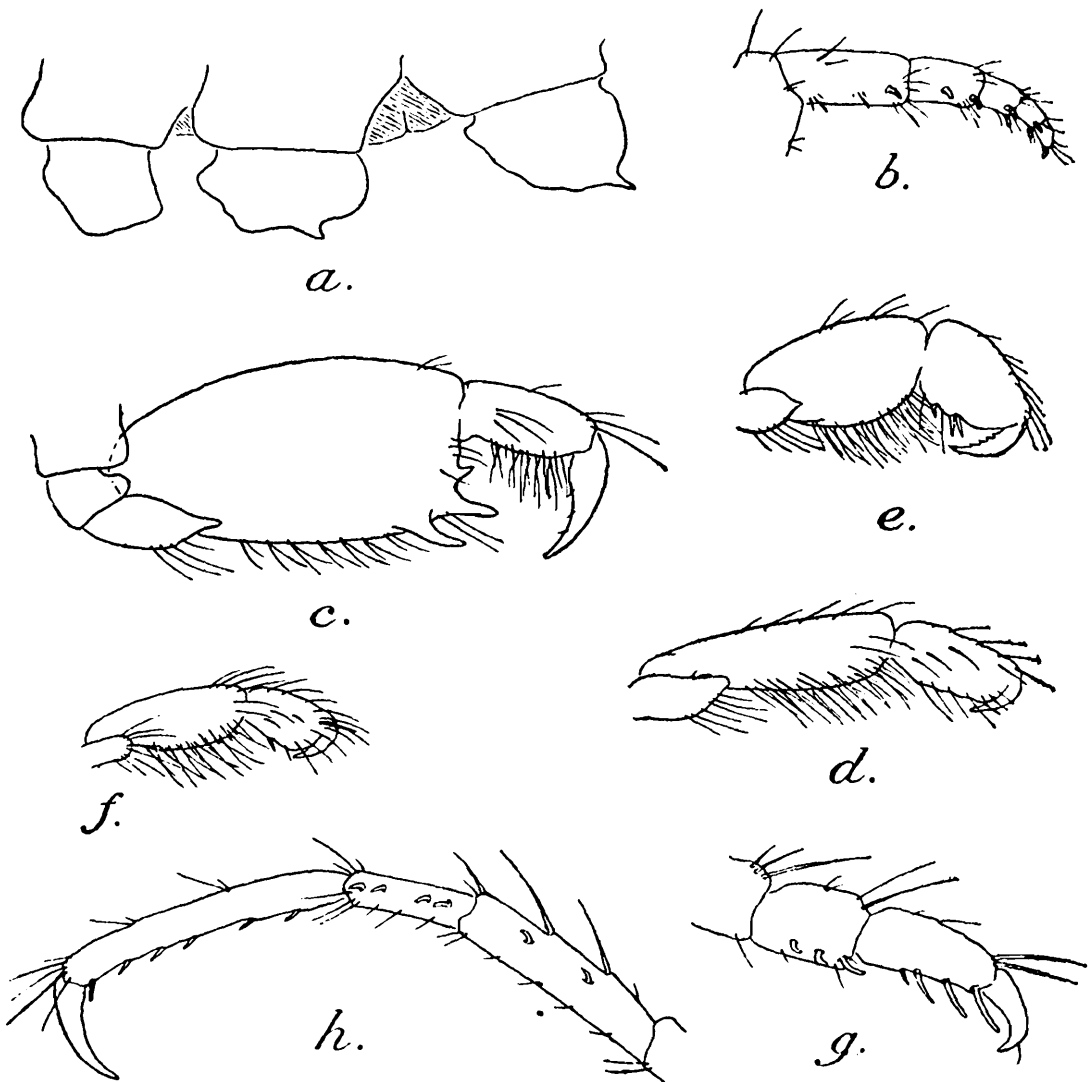
Grandiderella lignorum, sp. nov.

Locality.—Keurbooms River estuary, Plettenberg Bay, South Africa. (K. H. B. January 1931.) Under water-logged tree-trunks and drift-wood. ♂♂, ♀♀, and juv.

Description.—Ocular lobes short, obtuse. In ♂ side-plate 1 subtriangular, margin undulate, with a sharp point on lower anterior angle, side-plate 2 longer than deep, margin undulate, with a sharp point, but smaller than that on side-plate 1, side-plate 3 subquadrangular.

Antennae moderately setose. Antenna 1 slender, much longer in ♂ than ♀, 2nd peduncular joint $1\frac{1}{2}$ times 1st in ♂, $1\frac{1}{4}$ in ♀, 3rd nearly 4 times in length of 2nd in ♂, not quite 3 times in ♀, flagellum 18-19-jointed in ♂, 16-jointed in ♀, accessory flagellum microscopic, barely visible. Antenna 2 moderate, nearly as long as antenna 1 in ♀, in ♂ shorter and very stout, 5th peduncular joint about $\frac{2}{3}$ length of 4th, flagellum 5-jointed in ♂, with a stout curved spine on either side of each joint, in ♀ 4-jointed, with slender spines.

Gnathopod 1 ♂, 2nd joint moderate, parallel-sided, subtriquetral in cross-section (*cf.*, *bonnieri*), 5th with pointed process on lower distal



TEXT-FIG. 14.—*Grandidierella lignorum*, sp. nov. South Africa. *a.* side-plates 1-3 ♂; *b.* flagellum of antenna 2 ♂; *c.* inner view gnathopod 1 ♂ (finger drawn slightly too long); *d.* gnathopod 2 ♂; *e.* gnathopod 1 ♀; *f.* gnathopod 2 ♀; *g.* 5th-7th joints of peraeopod 3; *h.* 4th-7th joints of peraeopod 5.

corner, a smaller one between it and junction of 6th joint, and a third process on hind margin, subapical and arising from inner surface of joint, 6th fusiform, narrow basally, inner edge thin, cultrate, 7th shorter than 6th, slightly enlarged at base, outer margin gently curved. In ♀ 5th joint ovoid-subtrapezoidal, 6th shorter and smaller, oval, with oblique palm marked with 2 stout spines.

Gnathopod 2 ♂, 5th joint rather elongate, 6th slightly more than $\frac{1}{2}$ length of 5th, parallel-sided (or slightly fusiform), palm short, transverse, lower margin slightly undulate. In ♀ similar but not so elongate as in ♂, 6th joint very slightly wider at transverse palm than at base.

Peraeopods in general as in Stebbing's figures of *bonnieri*. Fifth joint in peraeopods 1 and 2 nearly twice as long as broad (*cf.*, Tattersall's fig. 7, *l.c.*, 1922). Fifth and 6th joints in peraeopod 3, and 4th and 5th joints in peraeopods 4 and 5 with stout, more or less curved, submarginal (on outer surface) spines in addition to the marginal armature. Distal

part of hind margin of 2nd joint in peraeopod 4 with a few plumose setae, whole margin of 2nd joint in peraeopod 5 with numerous plumose setae.

Uropod 3 with straight ramus in both sexes.

Length 5.5—6 mm. Colour: whitish with grey dendritic speckling, eyes black.

Remarks.—Giles and Schellenberg have referred to the association of *Grandidierella* with logs and drift-wood; Giles stating that the animals merely took advantage of the opportunity of concealing themselves, and Schellenberg observing that the animals are not to be regarded as true boring Crustacea. The South African specimens were taken lying on the mud after a log had been lifted up, and also from hollows on the underside of the log. It is hoped that this association with logs will not be cited in evidence of the "floating log" theory of distribution.

Family PHOTIDAE.

Photis digitata, sp. nov.

1921. Chilton, *Mem. Ind. Mus.* V, p. 554, fig. 12 (*longicaudata*, non Bate & Westwood).

1925. *id.*, *Mem. Asiat. Soc. Bengal* VI, p. 537 (*longicaudata* ?).

Localities.—Between Ernakulam and Edappalli, Cochin. H. S. Rao. January 1928. 1 ♂, 2 ovig. ♀♀.

In stake-net Manumbam Channel, Travancore. H. S. Rao. January 1928. 10 ♂♂.

Description.—Ocular lobes reaching to middle of 1st joint of antenna
1. Eyes large, round-oval. Telson triangular, apically pointed.

Flagellum of 1st antenna 6-jointed, of 2nd antenna 5-jointed.



TEXT-FIG. 15.—*Photis digitata*, sp. nov. a. side-plate and gnathopod 2 ♂; b. telson and 3rd uropods.

Gnathopod 2 ♂, 2nd joint considerably more elongate and narrower than in *longicaudata* (this joint not figured by Chilton), 5th joint with lower lobe produced in a digitate process extending half way along hind margin of 6th joint, the latter elongate, its breadth $1\frac{2}{3}$ (Chilton's figure) to 2 times in its length, palm with prominent defining angle and a large

triangular tooth near the hinge. In ♀ limb less elongate (see Chilton's figure), the digitate process of 5th joint not so developed as in ♂, but prominent, palm oblique, in the present specimens more concave than in Chilton's figure.

Uropod 3, outer ramus more slender than and slightly shorter than peduncle, 2nd joint very minute, inner ramus reduced to a mere spinule.

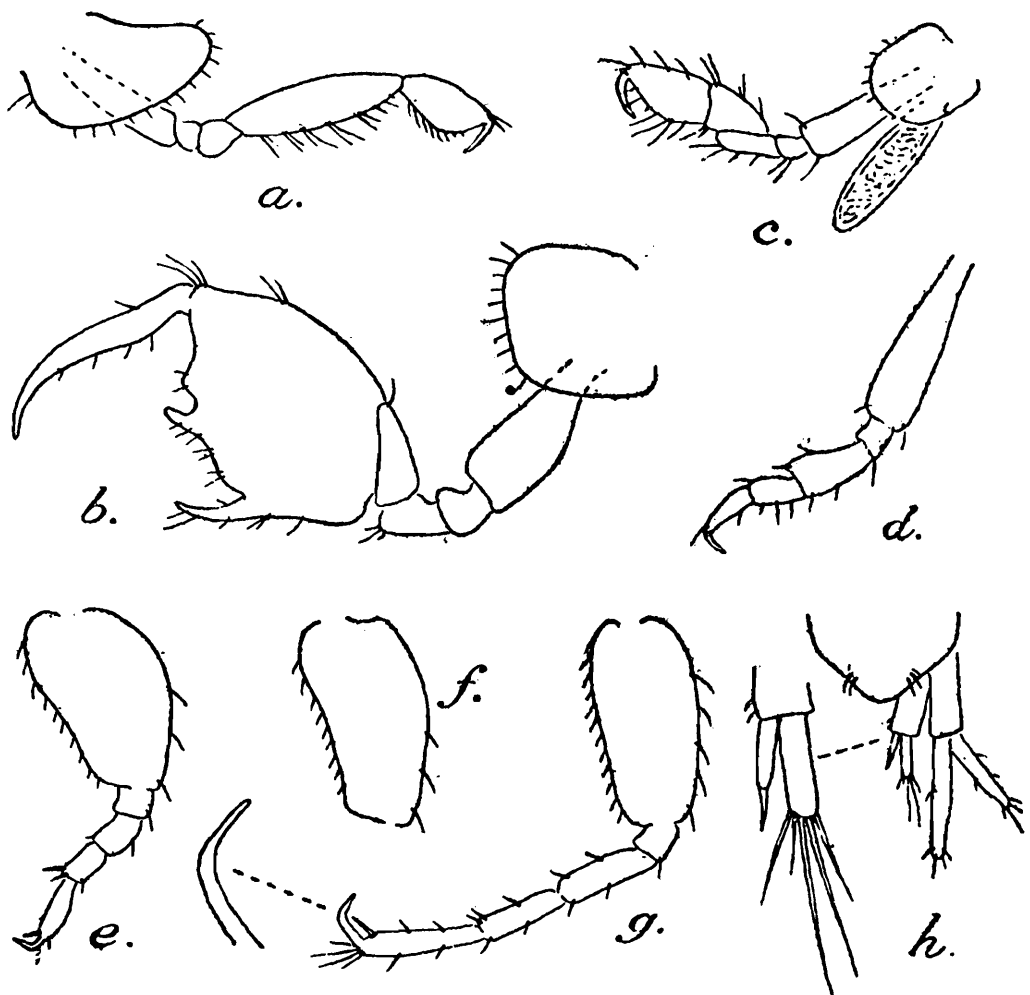
Length 3mm. Colour (as preserved) whitish, with grey mottling chiefly on peraeon segments 2-4, side-plates 1-4 and pleurae of pleon segments 1-3, a transverse band on hind margins of peraeon segments 5-7, peduncles of uropods 1 and 2; eyes black.

Remarks.—The very distinctive 2nd gnathopod of ♂, together with the 3rd uropod, and perhaps also the telson, seem to justify specific rank for this form.

Distribution.—Chilka Lake; Talé Sap, Siam.

***Photis geniculata*, sp. nov.**

Locality.—Vatta Kayal, Alleppey, Travancore. H. S. Rao and M. Sharif. January 1928. ♂♂, ovig. ♀♀, and juv.



TEXT-FIG. 16.—*Photis geniculata*, sp. nov. a. gnathopod 1 ♂; b. gnathopod 2 ♂; c. gnathopod 2 ♀; d. peraeopod 1; e. peraeopod 3; f. 2nd joint of peraeopod 4; g. peraeopod 5; h. telson and uropods 2 and 3, with the latter further enlarged.

Description.—Ocular lobes strongly produced, extending to, or almost to end of 1st joint of antenna 1. Eyes large, occupying whole of the lobe. Head including ocular lobes equal in length to peraeon segments

1 and 2 together. Peraeon and pleon smooth. Side-plate 1 much the largest, expanding below, lower hind corner quadrangular, lower front corner produced forwards covering the mouth-parts, bluntly rounded (*cf. Liljeborgia*) side plates 2-4 smaller, quadrangular, about as long as deep, lower angles rounded, 4 not excavate behind, lower margins of 1-4 sparsely setose; 5-7 decreasing in size, 5 and 6 bilobed, 7 ovoid.

Postero-inferior angle of pleon segment 3 rounded. Telson short, subtriangular, with 2 pairs of setules near apex.

Antenna 1 slender, very strongly setose, 1st and 3rd joints subequal, 2nd slightly longer, flagellum subequal to 2nd plus 3rd joints, 7-8-jointed, no accessory flagellum. Antenna 2 a little longer than antenna 1, in ♀ slightly stouter than 1st, but still slender, in ♂ considerably stouter than antenna 1, sparsely setose, flagellum 7-jointed, slightly longer than 5th peduncular joint.

Mouth-parts as in *Photis*, but mandibular palp rather slender (*cf., Podoceropsis*, Sars, *Crust, Norway I*, pl. cciv).

Gnathopod 1, 2nd joint not distally expanded, 5th fusiform, 6th rather more than half length of 5th, palm oblique.

Gnathopod 2 ♀ a little larger than gnathopod 1, 5th joint not produced at lower distal corner, 6th ovate, not wider than 5th, palm oblique. In ♂ greatly enlarged, 2nd joint enlarged distally, 5th comparatively small, cup-shaped, 6th large, obliquely oval, palm oblique, defined by a prominent spiniform process, with another smaller process in middle and a low rounded projection between the latter and hinge, finger with sinuous inner margin.

Peraeopods 1 and 2 not very stout, feebly setose, unguis straight.

Peraeopods 3-5, 2nd joint in peraeopod 3 obliquely ovate, hind margin slightly concave, in peraeopod 4 more oblong, in peraeopod 5 oblong-oval, hind margin in all three peraeopods entire, with sparse setules; 3rd-6th joints not strongly spinose or setose; unguis in all three peraeopods slender, geniculate, without accessory denticle on outer margin.

Uropods 1 and 2 moderately spinose. Uropod 3, outer ramus a little shorter than peduncle, tipped with 4-5 setae, inner ramus about $\frac{2}{3}$ length of outer ramus, tipped with one spine which reaches a trifle beyond apex of outer ramus.

Length 3 mm. Colour, as preserved, whitish with greyish speckling on peraeon and pleon, eyes black.

Remarks.—The first glance at the 2nd gnathopod of the ♂ gave the impression that these specimens were *Podoceropsis insignis* Chilton 1921; closer examination, however, showed that they could not belong to this species in spite of the brevity of Chilton's description. Chilton describes only the antennae and gnathopods, leaving it to be presumed that the other features, such as the peraeopods and uropods, were typical of the genus (*cf., Sars, Crust, Norway I*, pls, cciv, ccv).

The strongly produced ocular lobes resemble those of *Photis dolichommata* Stebb. The antennae are not densely setose as in *Podoceropsis insignis*. The mandibular palp is more like that of *Podoceropsis* than that of *Photis*. The 5th joint of 1st gnathopod proportionately to the 6th is longer than in Chilton's species.

The large size of the 1st side-plate and the geniculate ungues of peraeopods 3-5 are sufficiently distinctive to justify a new specific name for the present specimens. The inclusion of the species in the genus *Photis*, however, is to be regarded as a *pis aller*.

Family AMPITHOIDAE.

Ampithoe ramondi (Audouin).

1826. Audouin, *Descr. Egypte*. I, p. 93, Crust. pl. xi, fig. 6 (♀).
 1846. Lucas, *Expl. Alger*. I, p. 54, Crust. pl. v, fig. 3 (♂).
 ?1888. Giles, *J. Asiat. Soc. Bengal* LVII, p. 240, pl. x, figs. 1-7 (*inda*).
 1904. Walker in Herdman, *Ceylon Pearl Fish. Rep.*, p. 290, pl. vii, fig. 46 (*intermedia*).
 1909. *id.*, *Trans. Linn. Soc. London* XII, p. 342, pl. xliii, fig. 9 (*lobata*).
 1916. Barnard, *Ann. S. Afr. Mus.* XV, p. 253 (*vaiillanti*) (references).
 1928. Schellenberg, *Trans. Zool. Soc. London* XXII, p. 665.

Locality.—Tuticorin Pearl Banks. B. Prashad. April 1927. 1 ovig. ♀. 7 mm.

Remarks.—It is probable that *A. inda* (M. Edw.) 1830 should be included in the synonymy of this species.

Distribution.—Western Europe; Mediterranean; Indian Ocean; Southern Pacific; Azores; South Africa.

Family COROPHIIDAE.

Corophium triaenonyx Stebbing.

1904. Stebbing, *Spol. Zeylanica* II, p. 25, pl. vi A.
 1921. Chilton, *Mem. Ind. Mus.* V, p. 555.

Localities.—Backwater between Ernakulam and Edappalli, Cochin. H. S. Rao. January 1928. 31 ♂♂, ovig. ♀♀, and juv.

Quilon, Travancore. H. S. Rao and M. Sharif. February 1928. A lot ♂♂, ovig. ♀♀, and juv.

Neendakara Bar, Travancore. H. S. Rao and M. Sharif. February 1928. 13 ♂♂, ovig. ♀♀, and juv.

Vembanad Lake, Travancore. H. S. Rao and M. Sharif. January 1928. 3 ♂♂, 1 ♀.

Remarks.—Chilton (1921) doubted whether *triaenonyx* was more than a local variety of *crassicorne*, thereby completely ignoring the character of pleon segments 4-6, which are distinct in the former, and coalesced in the latter species. As this character is accepted by other authors (*e.g.*, Sars, Chevreux and Fage) Stebbing's species may be allowed to stand.

Distribution.—Ceylon; Chilka Lake. I have also collected the species in South Africa.

Family PODOCERIDAE.

Podocerus brasiliensis (Dana).

1904. Walker, *l.c.*, p. 296, pl. viii, fig. 52 (*synaptochir*).
 1909. *id.*, *l.c.*, p. 243 (*synaptochir*).
 1916. Barnard, *l.c.*, p. 279 (*synaptochir*).
 1917. Stebbing, *Ann. Durban Mus.* I, p. 447.
 1925. Barnard, *Ann. S. Afr. Mus.* XX, p. 366.
 1927. Gravely, *Bull. Madras Govt. Mus.* (n.s.) I, p. 123.
 1928. Schellenberg, *l.c.*, p. 674.

Locality.—Neendakara Bar, Travancore. H. S. Rao and M. Sharif. February 1928. 2 ♂♂, 5 ovig. ♀♀.

Remarks.—Although the identity of Walker's *synaptochir* appears to be correct, I am not aware that a direct comparison has been made with actual South American specimens. Dr. Gravely's specimens were identified by the late Dr. Chilton.

Distribution.—Ceylon; Gulf of Manaar; Suez, Port Said; Dar-es-Salaam, Zanzibar, Natal; Rio de Janeiro, and Antigua, W. I.

ISOPODA.

Family ANTHURIDAE.

1925. Barnard, *J. Linn. Soc. London* XXXVI, p. 109 (revision).

1927. Monod, *Bull. Soc. Zool. France* LII, p. 200.

Chilton in 1924 recorded *Calathura borradalei* from the Chilka Lake. This species has now been placed in the genus *Accalathura*. (Barnard, *l.c.*).

Cyathura indica Barnard.

1925. Barnard, *l.c.*, p. 140, pl. iv, fig. 7.

Locality.—Quilon, Travancore. H. S. Rao and M. Sharif. February 1928. 1 ovig. ♀.

Remarks.—There are three pairs of oostegites, enclosing 7 large ova.

Length 3.75 mm. Pale straw colour, with brown dendritic mottling forming a fairly well defined T-shaped mark on head, a median longitudinal line on the hinder peraeon segments, and irregular markings laterally; eyes black.

It is possible that the specimen recorded by Stebbing from Wasin, B. E. A. (1910, *Trans. Linn. Soc. London* XIV, p. 91), as *C. pusilla* should be identified with the present species because it had dark eyes—a point overlooked by me in my 1925 paper.

Apanthura sandalensis Stebbing.

1900. Stebbing, *Willey's Zool. Res.* pt. 5, p. 621, pl. lxxv A.

1914. Barnard, *Ann. S. Afr. Mus.* X, p. 342a, pl. xxviii, D (*dubia*).

1924. Chilton, *Mem. Ind. Mus.* V, p. 881.

1925. Barnard, *l.c.*, p. 141.

Locality.—Tirunayamkudam, Vembanad Lake, Travancore. H. S. Rao and M. Sharif. January 1928. 1 specimen.

Remarks.—This is the largest recorded specimen of this species, measuring 16 mm. in length. The palm of the 1st peraeopod has a well marked tooth at its base, and the 6th and 7th joints of the 7th peraeopod are minutely serrulate as described by Stebbing and Barnard.

The antennae are not brush-like, and there are no signs of oostegites.

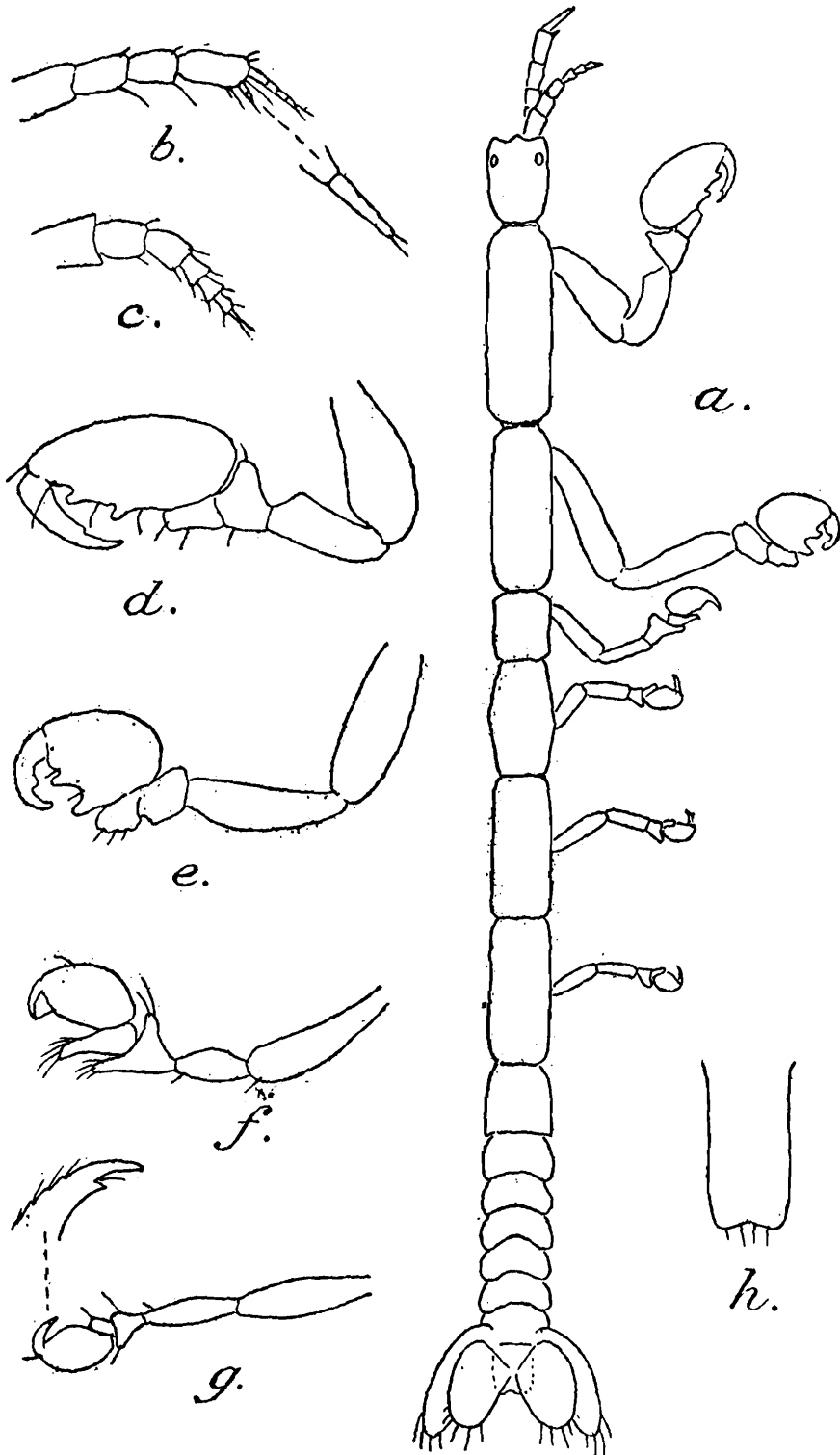
Pale yellowish, mottled with brownish dorsally on head, peraeon, pleon, telson and uropods; eyes black.

Distribution.—Loyalty Islands; Chilka Lake; Travancore, South India; South Africa.

***Xenanthura orientalis*, sp. nov.**

Locality.—Vatta Kayal, Alleppey. H. S. Rao and M. Sharif. January 1928. 1 specimen.

Description.—Body very slender. Eyes composed of 5-6 lenses aggregated together. 7th peraeon segment apodous. Telson scarcely twice as long as broad, apex very slightly indented, with 4 setae.



TEXT-FIG. 17.—*Xenanthura orientalis*, sp. nov. a. whole animal, antennae and legs of one side omitted; b. antenna 2, with secondary flagellum further enlarged; c. antenna 1; d. e. f. peraeopods 1, 2, and 3 respectively; g. one of peraeopods 4-6, with unguis further enlarged; h. telson.

Antenna 1, flagellum 4-jointed. Antenna 2, flagellum 4 (or 5)-jointed, the distal joints obscurely separated; secondary flagellum on 4th joint slender, 2-jointed.

Peraeopod 1, 5th joint apically blunt, 6th ovate, with 2 digitiform processes on palm, finger with slight knob at base of unguis.

Peraeopod 2, 5th joint crenulate on lower margin, apex blunt, 6th obovate, palm produced into 2 digitiform processes, finger curved, with knob at base of unguis.

Peraeopod 3, 4th joint triangular, lower apex produced, 5th with lower apex acutely produced, 6th ovate, with slight indication of a short palm.

Peraeopods 4-6 slender, 6th joint ovate, without any palm, finger obscurely serrulate on outer margin, and with a seta at base of unguis.

Uropod with endopod completely fused with peduncle, apically setose, exopod broadly oval, apically setose.

Length 4.5. Whitish, the dorsal surface faintly mottled with brown, eyes dark.

Remarks.—This specimen fully endorses the generic diagnosis based on the West Indies species *brevitelson* Brnrd. (Barnard, *l.c.*, 1925, p. 138), including the peculiar appendage or secondary flagellum on antenna 2. The Indian species is clearly distinguished by the details of its peraeopods. The apodous 7th peraeon segment indicates that the specimen is still juvenile.

The specimen was very delicate and was examined first in parachlorophenol+chloral hydrate, and afterwards mounted on a slide.

Family EURYDICIDAE.

Cirolana Leach.

1914. Vanhöffen, *Deutsch. Südpol. Exp. XV (Zool. VII)*, pp. 496 *et seq.*

1925. Hale, *Trans. Roy. Soc. S. Australia XLIX*, pp. 129 *et seq.*

1930. Monod, *Ann. Sci. Nat. Zool.* (10) XIII, pp. 129-183.

1931. Nierstrasz, *Siboga, Exp. Monogr. XXXIIc.*, pp. 149 *et seq.*

Among the numerous species of this genus there is a group of closely allied species characterized by a more or less conspicuous denticulation on the hind margins of some of the peraeon and pleon segments, and a sculptured telson. The following species fall into this group: *sculpta* M. Edw. 1840 (Malabar), *sulcata* Hansen 1890 (South Africa), *pleonastica* Stebb. 1900 (New Britain), *venusticauda* Stebb. 1902 and *fluviatilis* Stebb. 1902 (South Africa), *willeyi* Stebb. 1904 (Ceylon), *sulcaticauda* Stebb. 1904 (Maldives), *nigra* Chilton 1924 (Chilka Lake), and *pustulosa* Hale 1925 (Queensland).

C. sculpta still remains a *species inquirenda*, as it does not seem to have been recognized by subsequent authors (Krauss' 1843 record from South Africa is almost certainly erroneous: see Stebbing, *Mar. Invest. S. Africa II*, 1902, p. 51). *C. nigra* Chilton is in my opinion synonymous with *willeyi*.

C. sulcata is perhaps not strictly admissible in this group, but is included owing to a slight superficial likeness to *sulcaticauda*, and to the fact that it is also an inhabitant of the Indo-Pacific region.

The character of the frontal lamina is essential in diagnosing the species, and figures are given here supplementing the earlier descriptions of two species.

Another character, to which so far as I am aware, attention has been paid only by Vanhöffen (*l.c., supra*) is the openings of the vasa deferentia in the ♂. Vanhöffen gave figures for all the species described by him except *hirtipes*, of which species he thought he had no ♂♂. The reason for this exception is probably due to the fact that in this species there are no upstanding papillae (penial processes), the vasa deferentia opening by pores flush with the surface of the 7th sternite.

In some species a pair of very short conical papillae are present; and in other species paired digitiform processes of greater or lesser length are developed. Males of the latter species are easily distinguished, but the openings of the vasa deferentia when flush with the surface are not so easily observed, and a ♂ may be thought to be a ♀ with undeveloped brood-pouch.

The above mentioned species can be separated as follows:—

- | | | |
|---|--|--------------------------------------|
| I. Head with rostral point (more or less separating the bases of the 1st antennae). | | |
| A. Frontal lamina pentagonal (text), hexagonal (figure) | | <i>willeyi</i> (syn. <i>nigra</i>). |
| B. Frontal lamina quadrangular, with anterior extension to meet rostral point | | <i>venusticauda</i> . |
| C. Frontal lamina rounded in front | | <i>sulcaticauda</i> ¹ . |
| II. Head without rostral point, anterior margin evenly rounded, bases of 1st antennae contiguous. | | |
| A. Frontal lamina narrow pentagonal, angular in front, not freely projecting. | | |
| 1. Frontal lamina widening to middle. Pleon not tuberculate. Telson grooved. Penial processes ♂ well developed | | <i>sulcata</i> . |
| 2. Frontal lamina widest at base. Pleon tuberculate. Telson with double row of elongate tubercles. Vasa deferentia opening flush with surface | | <i>pleonastica</i> . |
| B. Frontal lamina rounded in front. | | |
| 1. Frontal lamina freely projecting in front. Vasa deferentia opening flush with surface | | <i>fluvialis</i> . |
| 2. Frontal lamina presumably not freely projecting (judging from figure) | | <i>pustulosa</i> ² . |

Cirolana pleonastica Stebbing.

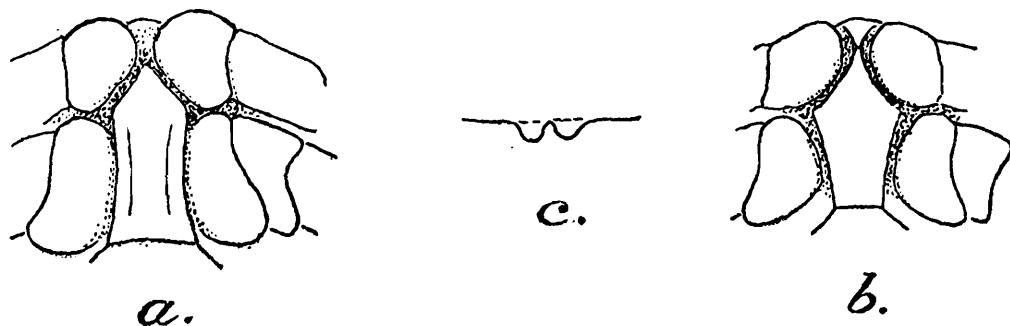
1900. Stebbing, *Willey's Zool. Res.* V, p. 629, pl. lxxvii A. [*non* Chilton 1924 and 1926].

Owing to the kindness of Dr. I. Gordon of the British Museum, I have been able to examine some co-types of this species from Blanche Bay, New Britain, and am thus able to supply a figure of the one important character which Stebbing omitted both in his description and his figure.

¹ Dr. Isabella Gordon of the British Museum informs me that in this species, as far as the poor condition of the specimens permits accurate study, there appears to be a tiny rostral point.

² Hale says "with a tiny median subtriangular process, which does not separate the first antennae". The species would appear to fall under division II in the present key.

The frontal lamina is narrow pentagonal, widest at base, and slightly narrowing distally, the front apex angular, not projecting, and not visible beyond the margin of head when viewed from the dorsal aspect.



TEXT-FIG. 18.—*Cirolana*. a. frontal lamina and bases of antennae of *pleonastica* Stebb. (co-type ex Brit. Mus.); b. the same of *willeyi* Stebb. (*nigra* Chilton, Chilka Lake); c. penial processes on 7th peraeon sternite of *willeyi*.

The vasa deferentia open by pores flush with the surface of the 7th sternite.

Cirolana fluviatilis Stebbing.

1902. Stebbing, *Mar. Invest. S. Africa* II, p. 52.

1920. Barnard, *Ann. S. Afr. Mus.* XVII, p. 346, pl. xv, fig. 19 (frontal lamina).

1924. Chilton, *Mem. Ind. Mus.* V, p. 882, pl. lx, fig. 2 (*pleonastica* non Stebb.).

1926. *id.*, *Rec. Ind. Mus.* XXVIII, p. 180, fig. 2 (*pleonastica* non Stebb.).

Locality.—In stake-net, Manumbam, Travancore. H. S. Rao. January 1928. 23 immature specimens.

Description.—Anterior margin of head evenly convex, without rostral point. Bases of 1st antennae in contact, first two joints of peduncle not very clearly distinct, flagellum 7-8-jointed.

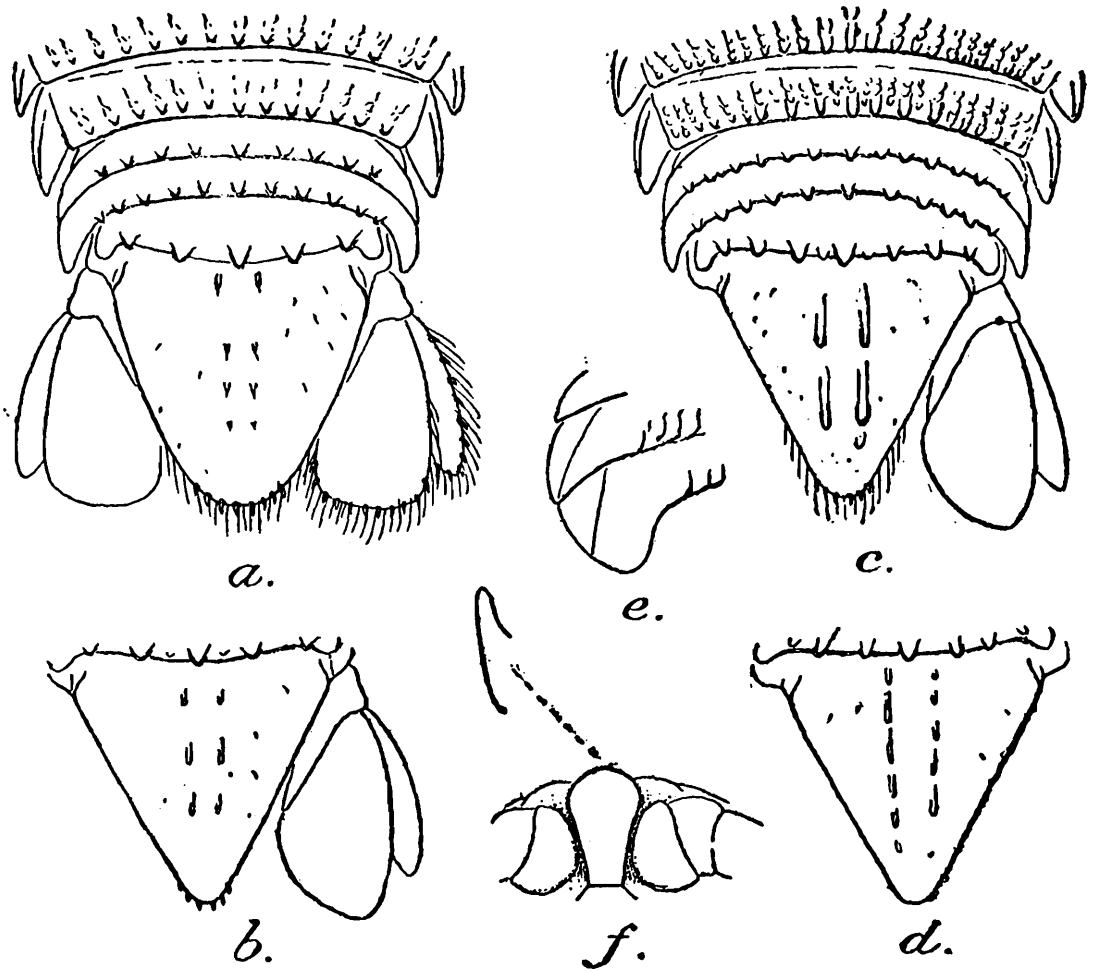
Frontal lamina nearly twice as long as broad, slightly widening to the freely projecting rounded anterior margin; in some specimens the anterior margin is semicircularly rounded, in others somewhat flattened, but never truncate.

Side-plates 6 and 7 with oblique ridge, more distinct on the 7th. Hind margins of hinder peraeon segments denticulate, denticulations beginning faintly on segment 4 and increasing in distinctness. On the lateral portions of segments 6 and 7 there are faint indications of a 2nd row of tubercles, which in the adult will cause the corrugated appearance. Pleon segments 2-5 also denticulate, segment 5 with 5 teeth.

Telson in young and half-grown broadly rounded at apex, with 8 spines among the plumose setae, a short ridge at each basal outer corner, a pair of small submedian tubercles at base, followed by two more pairs, the latter smaller and often inconspicuous (best seen in a dried specimen); scattered setae on surface of telson. In adult specimens from Chilka Lake (identified by Chilton as *pleonastica*) the telsonic apex is narrowly rounded, with 6 spines, the lateral margins straight, and the double row of median tubercles better developed.

Uropods, inner ramus broadly rounded, with 11 spines around distal margin, outer ramus slightly shorter, oval, apically narrowly rounded, with 11 spines along outer margin and around apex. In the adult a

slight change in the shape of the inner ramus occurs, as is best seen by comparing figs. 19 *a* and *b*.



TEXT-FIG. 19.—*Cirolana fluviatilis* Stebb. *a.* peraeon segments 6 and 7 and pleotelson of juv., 5 mm. in length, Travancore; *b.* telson of ♂, 8.5 mm., Chilka Lake (spines and setae on uropod omitted); *c.* co-type ♂, 11 mm., from East London, South Africa; *d.* telson of strongly sculptured ♂, 11 mm., from Port Elizabeth, South Africa; *e.* lateral view of pleon segments 2-4 (left side); *f.* frontal lamina and bases of antennae, with profile of former.

On peraeon segment 7 in adult ♂ from Chilka Lake the vasa deferentia open by two pores flush with the sternal surface.

Appendix masculina on pleopod 2 straight, not longer than inner ramus.

Remarks.—The present Travancore specimens are not fully mature but through the kindness of Dr. Chopra I have been able to examine some of the Chilka Lake specimens, including adult ♂ and ♀, identified by Chilton as *pleonastica*. Chilton's erroneous identification is excusable in view of Stebbing's omission to describe the frontal lamina of *pleonastica*. I have not seen the specimens from Talé Sap, but assume that they likewise are not the true *pleonastica*.

The change in the shape of the telson, from the broadly rounded apex of the young and half-grown, to the narrowly rounded apex of the adult, is interesting and important. The apex is slightly narrower in the adult ♂ than in the ovigerous ♀.

As the pleon of *fluviatilis* has never been figured, this deficiency is here remedied. The figures will serve also to confirm my identification of the Indian specimens with the species originally described from South Africa.

I have already (1920) indicated a certain amount of variation in the development of the ornamentation, but I did not then realize that this difference is to some extent sexual. Males are often far more strongly sculptured than the females, some of which latter barely show the crenulations on the pleon segments or the tubercles on the telson. This is especially noticeable in some small though ovigerous specimens, 7 mm. in length, from Keurbooms River (South Africa).

The slit on the lateral margin of the 4th pleon segment mentioned by Stebbing (1902, *l.c.*, p. 52) is really a ridge; there is a similar ridge on pleon segment 3, and both ridges are not peculiar to *fluviatilis*, but are found *e.g.* in *pleonastica* Stebb., *sulcata* Hansen, and (on 4th segment only) *venusticauda* Stebb.

Additional South African localities: St. Lucia Bay, Zululand (H. W. Bell-Marley, 1919, 1 ♂); Keurbooms River, Plettenberg Bay (K. H. B. January 1931. ♂♂ ♀♀ from submerged rotting logs in estuary).

Distribution.—Chilka Lake; Talé Sap, Siam; South Africa.

Cirolana willeyi Stebbing.

1904. Stebbing, *Spolia Zeylanica* II, p. 11, pl. iii.

1924. Chilton, *Mem. Ind. Mus.* V, p. 884, pl. lx, fig. 3 and text-fig. 6 (*nigra*).

Although not mentioned by Chilton, there is a most remarkable resemblance between *nigra* and *willeyi*. I have examined specimens of the former, including adult ♂ and ♀, from Maludaikuda, Chilka Lake. The ♀ is 6.5 mm., the ♂ 7 mm. in length, thus being larger than the measurement given by Chilton (5 mm.), but not as large as Stebbing's 8.75 mm. for *willeyi*.

An immature specimen, 4.3 mm. in length, agrees with Chilton's figure in having a rather broadly rounded telsonic apex. The adults, however, have the apex more narrowly rounded (as in *fluviatilis*) and resemble Stebbing's figure of *willeyi*. There is no trace of tubercles on the head and 1st peraeon segment in the ♂ such as Stebbing describes.

The head has a distinct rostral point as in *willeyi*. The frontal lamina, however, is definitely (in all three specimens) pentagonal, with the anterior apex meeting the apex of the rostral point. Stebbing says the frontal lamina is pentagonal in *willeyi*, but his figure shows it hexagonal, that is with the anterior apex truncated.

Stebbing's description of the coloration of *willeyi*, which is unusually strong for a member of this genus, exactly fits the present specimens.

In view of the similarity in the sculpture, making due allowance for the larger size of Stebbing's specimens, I have not the least doubt that *nigra* is the same species as *willeyi*, and that Stebbing's figure is either inaccurate, or was drawn from a different specimen from that on which the description was based, and exhibiting a slight abnormality.

The vasa deferentia open on the 7th sternite by 2 very short and almost contiguous papillae.

Distribution.—Lake Negombo, Ceylon; Chilka Lake.

Family IDOTEIDAE.

Synidotea variegata Collinge.

1917. Collinge, *Rec. Ind. Mus.* XIII, p. 2, pl. i.

1924. Chilton, *Mem. Ind. Mus.* V, p. 891, pl. lx, fig. 6.

Locality.—In stake-net, Manumbam, Travancore. H. S. Rao. January 1928. 3 juv.

Remarks.—These young specimens, 4-6 mm. in length, are probably referable to this species.

No trace of any oblique ridge on the peduncle of the opercular uropods can be seen; at the outer apex of the peduncle there are 3 plumose setae.

Distribution.—Gulf of Manaar; Chilka Lake.

Family ASELLIDAE.

Caecidothea kawamurai Tattersall.

1921. Tattersall, *Mem. Asiat. Soc. Bengal* VI, p. 417, pl. xv, figs. 11-18.

1927. Ueno, *Mem. Coll. Sci. Kyoto Imp. Univ.* (B) III, p. 360, fig. 3.

Locality.—From well in Otsu, Japan. Dr. Kawamura. July 1917. 3 ♂♂, 17, 19 and 28 mm. in length.

Remarks.—Only three features call for mention. One of the present specimens is considerably larger than Tattersall's largest ♂, which was 17 mm. in length. The largest specimen has only one uropod remaining; the outer ramus is $\frac{1}{3}$ the length of the inner ramus, which is $\frac{5}{6}$ the length of the peduncle.

Both the larger specimens have a series of conical tubercles on the under surface of the flagellum of the 2nd antenna, one tubercle on every fourth joint; towards the end of the flagellum they become feeble, and after the 75th joint cannot be traced. Each tubercle is surmounted by a small tuft of setae.

The penes are inserted far apart (as in *Asellus*), converging inwards at an angle of about 45°, meeting at approximately a right angle at the level of the middle of the peduncles of the 1st pleopods. Each penis is thus a little longer than half the distance separating the bases of the two; it is terete and very slightly clavate apically.

TANAIDACEA.

Family APSEUDIDAE.

1913. Nierstrasz, *Siboga Exp. Monogr.* XXXII a. (list of species to date).

1914. Vanhöffen, *Deutsch. Südpol. Exp.* XV (Zool. VII), p. 460.

Apseudes Leach.

1914. Barnard, *Ann. S. Afr. Mus.* X, p. 327 a.

1920. *id.*, *ibid.*, XVII, p. 321.

1927. Stephensen, *Vid. Medd. Dansk. Naturh. For.* LXXXIII, p. 374.

***Aapseudes chilensis* Chilton.**

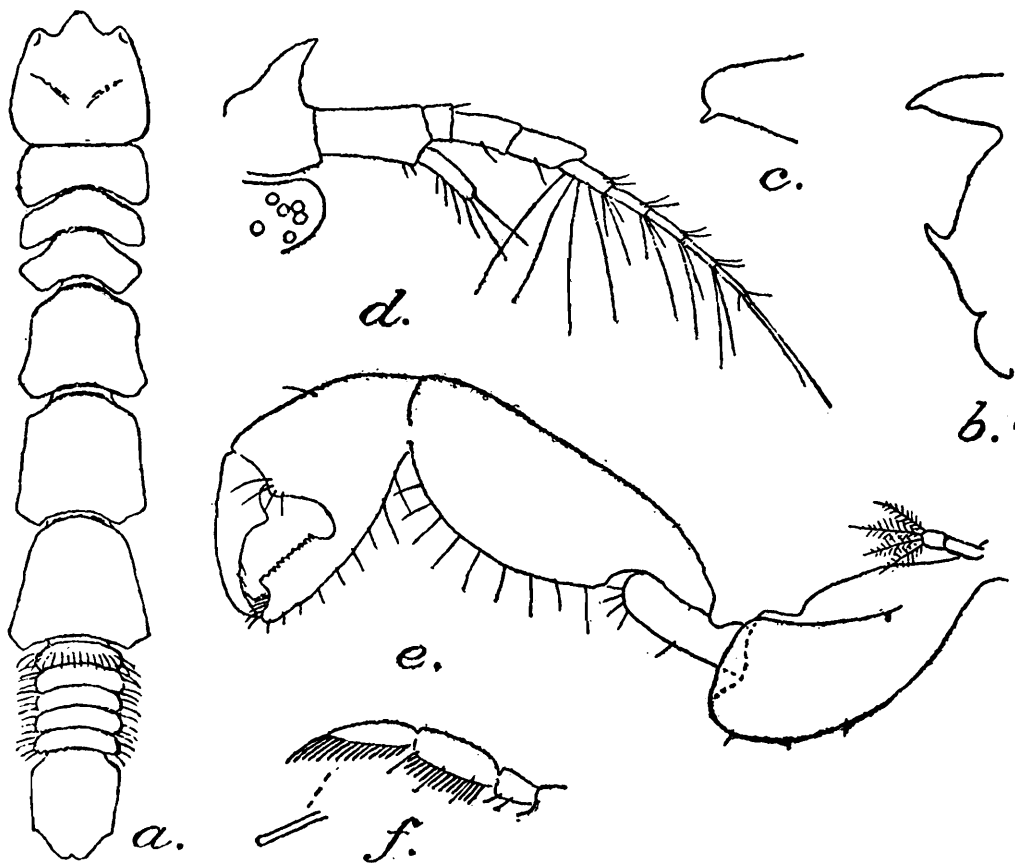
1924. Chilton, *Mem. Ind. Mus.* V, p. 879, text-fig. 1 and pl. lx, fig. 1.
 1926. *id.*, *Rec. Ind. Mus.* XXVIII, p. 175, figs. 1 a-r (*sapensis*).

Localities.—Tirunayamkudam, Vembanad Lake, Travancore. H. S. Rao and M. Sharif. January 1928. 5 ♂♂, 2 ovig. ♀♀, 3 immat. ♀♀.

Vatta Kayal, Alleppey, Travancore. H. S. Rao and M. Sharif. January 1928. A lot ♂♂, ovig. ♀♀, and juv.

Salt Lakes, Calcutta, Lower Bengal. Dr. B. N. Chopra. 23-24th February 1928. 2 ♂♂, 2 ovig. ♀♀, 1 immat. ♀, 3 juv.

Description.—Body not very slender, approximately parallel-sided, the carapace not much wider, the pleon not much narrower, than the rest of the body, smooth. Carapace (head plus 1st peraeon segment) about as long as its greatest width (posteriorly), slightly narrower anteriorly, rostral point triangular, apex sharp. In the Lower Bengal specimens (as in those from Chilka Lake, which I have been able to examine) there is a distinct spiniform point directed ventrally, which in the ♂ is especially noticeable. Ocular lobes rounded, obscurely demarcated from the head by a shallow groove. Each eye consisting of 6-7 irregularly aggregated lenses, unpigmented.



TEXT-FIG. 20.—*Aapseudes chilensis-sapensis* Chilton. a. dorsal view of whole animal; b. profile of rostrum, epistome and upper lip, Travancore specimen; c. profile of rostrum of Lower Bengal specimen; d. antenna 2 and ocular lobe of head; e. peraeopod 1 ♂, outer view; f. mandibular palp.

Peraeon segments 2-4 (1st-3rd free segments) short, antero-lateral angles of anterior segment rounded. Segments 5-7 subquadrangular,

slightly wider posteriorly than anteriorly. Pleon segments distinct, laterally setose. A fringe of setae (often rubbed off) on 1st pleon segment (not on hind margin of 7th peraeon segment, as Chilton says). Telson oval-oblong. On each of peraeon segment 7 and pleon segments 1-6 a small medio-ventral spiniform process, feebler in ♀ than in ♂.

Antenna 1 in ♂ equal to distance between point of rostrum and middle or end of 5th peraeon segment, peduncular joints smooth, not dentate, inner flagellum in ♂ half as long again as peduncle, outer flagellum subequal to peduncle,¹ with 20-24 and 12-15 joints respectively, but the joints very obscurely demarcated and difficult to count; in ♀ both flagella subequal to peduncle.

Antenna 2 reaching to end of, or slightly beyond, apex of peduncle of antenna 1, 1st peduncular joint with strong acute tooth on inner side, 2nd joint cylindrical, with apical scale (exopod), 3rd joint short, 4th and 5th subequal, flagellum of about 6 obscurely demarcated joints.

Epistome with small upturned spiniform process, often obscure.

Mandibular palp stout, 2nd and 3rd joints with comb-like series of stiff, blunt spines, those on 3rd joint increasing in length distally, a few setae in addition.

Maxillae 1 and 2 as in *A. spinosus* (Sars, *Crust. Norway* II, pl. i).

Maxilliped, 2nd (basal) joint stout, 3rd short but broad, 4th broad, 5th and 6th chopper-shaped, 4th-6th joints with numerous setae, inner plate with 4 coupling-hooks. Epipod large, with apical process as in *A. spinosus*.

Peraeopod 1 (gnathopod) ♂ robust, 2nd joint stout, keeled on inner anterior edge and on lower (posterior) edge, the 2-jointed exopod with 4 plumose setae, 3rd and 4th joints fused, 5th elongate-ovate, with spaced setae on lower edge, 6th with small triangular setose process near finger-hinge, followed by a semicircular excision, thumb with an inner incisiform crenulate cutting-edge, and subacute apex, finger curved, with tooth on inner margin near base. In ♀ slender and elongate, 2nd joint fusiform, 5th cylindrical, slightly widening distally, 6th minutely serrate apically, finger curved, narrowing rather rapidly.

Peraeopod 2, 2nd joint stout, the 2-jointed exopod with 5 plumose setae, 3rd joint short, 5th apically expanded, 6th obovate, 7th small, spiniform, margins of 5th and 6th with numerous close-set elongate spine-setae.

Peraeopods 3-7 similar to one another, but 2nd joint in peraeopods 3 and 4 not so stout, and fringes of plumose setae present only on peraeopod 7. The inner (lower) margins of 5th and 6th joints with double rows of spine-setae. Plumose setae only on outer (hinder) margins of 2nd, 4th and 5th joints and distal half of inner margin of 2nd joint. Finger spiniform.

Five pairs of pleopods, peduncle short, rami about twice as long, subequal (neither ramus 2-jointed).

Uropods slender and elongate, inner ramus equal to length of 7th peraeon segment plus pleo-telson, the outer ramus $\frac{1}{2}$ length of inner, both rami so obscurely jointed that the number of joints cannot be counted even approximately.

¹ In most species apparently the outer one is the longer of the two flagella.

In ♂ the vasa deferentia open at the apex of the spiniform process on 7th peraeon sternite.

Length ♂ 7.5 mm., ♀ smaller. Whitish, with the digestive canal showing through more or less darkly. Spermatozoa in the vasa deferentia (seen through the integument) and after extrusion glistening white.

Remarks.—The growth and structure of the brood-pouch is interesting and deserving of closer study.

In non-ovigerous ♀♀, which to judge by size are in the penultimate stage, there are five pairs of little oval lamellae at the bases of the 1st-5th pairs of peraeopods. Those at the base of the 1st pair of peraeopods, though quite distinct in the immature, seem to disappear in the ovigerous animal; at least I have not succeeded in observing them. The actual brood-pouch is formed by the four hinder pairs of lamellae.

Some curious modifications occur in the fully developed brood-pouch. As the lamellae (oostegites) start by being *separate external* outgrowths of the ventral surface, one would expect them to remain separate when the animal undergoes its final or breeding moult. In some cases this does happen, *e.g.*, in some of the ovigerous ♀♀ from Vatta Kayal, all 4 pairs of lamellae are distinct. In other ♀♀ from the same lot, the 4 lamellae of one side are completely conerescent. In both the ovigerous ♀♀ from Vembanad Lake, both those from Lower Bengal, and some from Vatta Kayal, not only are the 4 lamellae of each side united, but they are united with those of the opposite side, so as to form a single complete ventral lamina, open only in front (like a kangaroo's pouch).

The above references are quoted in chronological order, but I do not wish to imply that I consider *sapensis* definitely a synonym of *chilkensis*; although after comparing topotypes from both Chilka Lake and Talé Sap with the present specimens I feel that eventually only one species will be recognized.

Chilton's figure (pl. lx, fig. 1) represents both the 2nd peraeon segment and the ocular lobes as too long. On the other hand in *sapensis* the ocular lobes are not indicated at all in the figure, though they are present in the specimens. Thus from the figures one might assume a difference which in fact is non-existent.

The Chilka Lake specimens have the 1st peduncular joint on antenna 2 strongly toothed, as in the description of *sapensis*, but which is not mentioned in that of *chilkensis*. The 1st and 2nd legs of the present specimens are more like those of *sapensis*, but the 2nd joint of peraeopod 1 is intermediate in character: it is considerably stouter than in typical *chilkensis*, but not so stout or so strongly produced apically as in *sapensis*. The latter feature somewhat depends on whether the leg is flexed (Chilton's figure) or extended.

The most noticeable difference is in the tooth of the fixed finger (5th joint) of peraeopod 1, and the 5th and 6th joints of peraeopod 2. In case it should later appear desirable to keep these two forms separate, the present specimens are referable as follows:—

Lower Bengal, Salt Lakes
Travancore localities

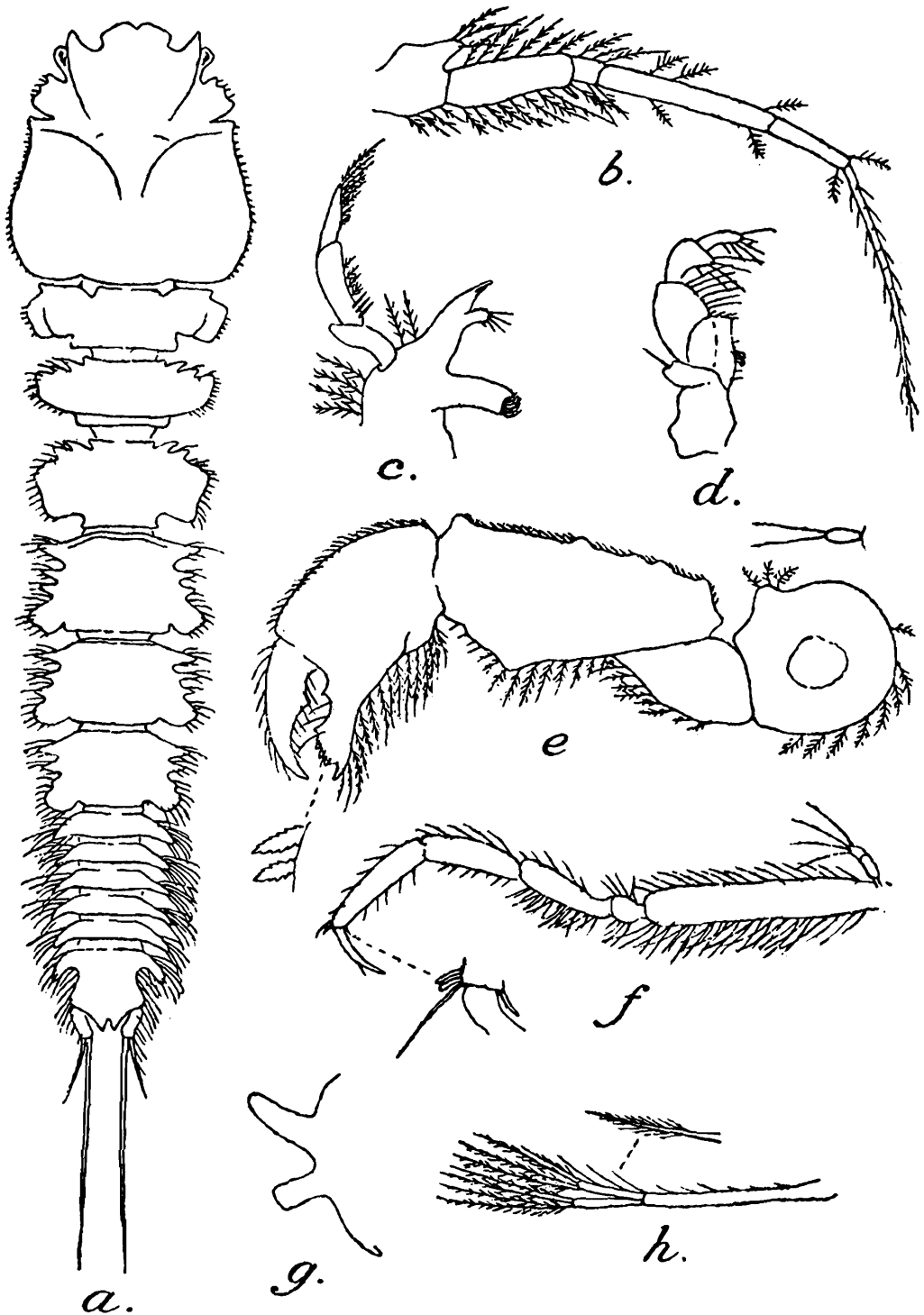
chilkensis form.
sapensis form.

***Aapseudes gymnophobia*, sp. nov.**

Localities.—In rotting screw-pine, Vypin, Cochin. H. S. Rao. January 1928. 1 ♂.

Tiruppunithura, Cochin. H. S. Rao and M. Sharif. December 1927. 1 immature ♀.

Description.—Body not very slender, tapering evenly from the widest portion of the carapace, whole dorsal surface with very fine pilosity, giving place to plumose setae on the lateral portions, and



TEXT-FIG. 21.—*Aapseudes gymnophobia*, sp. nov. a. whole animal; b. antenna 2 ♂; c. mandible; d. maxilliped; e. pereopod 1 ♂, inner view with epipod from pereopod 1 ♀; f. pereopod 2 ♂; g. profile of epistome and upper lip ♂; h. pleopod.

especially thick on the pleurae of the pleon segments. Carapace slightly longer than its greatest width, frontal margin produced in two short truncate lobes with intervening notch; ocular lobes in lateral view rounded, with a slight dorsal crest which in dorsal view forms an acute point above the actual eye; the latter faintly pigmented. Lateral margin with two notches.

Peraeon segments increasing slightly in length to the 5th (=4th free segment), which is longest, 6th and 7th slightly shorter. Segment 2 with the anterior margin raised or costate on either side of the central articulation, where it butts against the hind margin of the carapace. Segments 3-7 with the lateral margins digitate or dentate.

Pleon segments distinct, narrower than peraeon, but with prominent subacute pleural processes.

Telson shorter than pleon, its basal part resembling one of the preceding pleon segments with lateral process on either side, distal part pentagonal, the apex shortly cleft.

On segment 3 (2nd free segment) a small medio-ventral conical tubercle pointing forwards, in both sexes; in ♂ a similar but very small tubercle on the 4th segment, obsolete in ♀.

Antenna 1, peduncle about equal to length of carapace, smooth, 1st joint slender, about $\frac{2}{3}$ length of carapace, with plumose setae on inner and outer margins, 2nd joint less than half length of 1st, with 1 or 2 plumose setae on margins, 3rd $\frac{2}{3}$ length of 2nd, outer flagellum about equal to 1st peduncular joint, 16 (♂) or 14 (♀)-jointed, inner flagellum 8 (♂) or 7 (♀)-jointed. Antenna 2 as long as peduncle of antenna 1, 1st joint with process on inner apex, 2nd with slightly sinuous outer margin, apical process minute, spiniform, concealed among plumose setae, 4th elongate in ♂, in ♀ not exceeding 2nd plus 3rd joints, 5th half length of 4th in ♂, in ♀ equal to 2nd, flagellum 11 (♂) or 8 (♀)-jointed.

Epistome in ♂ with 2 projections, the upper one projecting slightly upwards; in ventral view both are apically blunt but apparently not mutilated. In ♀ epistome evenly convex.

Mandible with plumose setae on outer surface of trunk, cutting-edge obscurely bidentate, secondary cutting-edge tipped with several setae, molar process prominent, palp stout, 2nd joint with 3 spine-setae near base, and short plumose setae on inner margin, 3rd joint with plumose setae increasing in length distally.

Maxillae 1 and 2 normal. Maxilliped, 2nd joint moderately broad, 3rd short and broad with 1 seta on outer margin, 4th ovate, 5th chopper-shaped, 6th cylindrical, 4th-6th setose, inner plate with 2 coupling hooks. Epipod normal (Sars, *l.c.*, pl. i).

Peraeopod 1 (gnathopod) in ♂ robust, 2nd joint subglobular, with subcentral (not terminal) point of attachment, the projecting hind margin with plumose setae, a knob on upper anterior margin, exopod not observed, 5th joint with small knobs on upper margin, thumb of 6th joint with basal tooth, incisiform cutting-edge set with a few short minutely serrulate spines, and unguiform apex, finger with basal tooth; all the joints with fine pilosity passing into longer plumose setae distally and on lower margin of 5th joint. In ♀ of same general shape, robust but not so robust as in ♂, exopod very minute, with 2 setae.

Peraeopods 2-7 similar to one another, slender, 2nd joint cylindrical, finger slender, with gently curved unguis: both margins of 2nd joint in ♂ with thick fringe of plumose setae, other joints less setose. In ♀ similar to ♂, but less setose, the thick fringes on 2nd joint absent. Exopod on peraeopod 2 distinct in both sexes, 2-jointed, pedunculate, with 4 setae.

Five pairs of pleopods; peduncle slender, elongate, rami less than half length of peduncle, neither apparently 2-jointed.

Uropods, peduncle thickly covered with plumose setae, inner ramus approximately 20-jointed, outer ramus 7-jointed, jointing very obscure.

Female with 5 pairs of incipient brood-lamellae.

Length: ♂ 7.5 mm., ♀ slightly smaller. Whitish, the eyes faintly pink.

Remarks.—The lateral digitations of the peraeon segments produce some resemblance to *A. meridionalis* Richardson 1912, and *A. galapagensis* Richardson 1912.

The small size of the "scale" on antenna 2 points to *Parapseudes*, but inclusion in that genus is excluded by the presence of the normal 5 pairs of pleopods. The slender elongate peduncle of the latter is remarkable.

Possibly the absence of expanded (fossorial) joints on the 2nd peraeopod (*cf.*, *Pagurapseudes* Whitelegge), and its consequent similarity with the other peraeopods (3rd-7th) might suggest a generic separation, but for the present this is unnecessary.

The anti-nudist propensity of the specimens intensifies the difficulty of studying them.